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Publication	PECVD Reaction	'DELTA-n' Control Method	Post-dep. Thermat Treatment T° (°C)
Valette S.,1987	Unknown	P doping	Not specified
Valette S.,1988	Unknown	P doping	400°C
Grand G., 1990	Unknown	P doping	1000°C
Lui K., 1995	Unknown	Content in Si, P	Not specified
Ojha S., 1998	Unknown	Ge, B, or P doping	Not specified
Canning J., 1998	Unknown	Ge doping	Not specified
Bulla D., 1998	TEOS	TEOS	Not specified
Johnson C., 1998	**$SiH_4 + O_2$**	**Si ion Implantation**	**400°C**
Boswell R. W., 1997	$SiH_4 + O_2$	SiH_4/O_2 flow ratio	1000°C
Bazylenko M. V., 1995	$SiH_4 + O_2 + CF_4$	$(SiH_4+O_2)/CF_4$ flow ratio	Not specified
Bazylenko M. V., 1996	$SiH_4 + O_2 + CF_4$	$(SiH_4+O_2)/CF_4$ flow ratio	1000°C
Durandet A., 1996	**$SiH_4 + O_2 + CF_4$**	**$(SiH_4+O_2)/CF_4$ flow ratio**	**100°C**
Kasper K., 1991	$SiH_4 + N_2O$	SiH_4/N_2O flow ratio	1060°C
Laï Q., 1992	$SiH_4 + N_2O$	SiH_4/N_2O flow ratio	1100°C
Lai Q., 1993	$SiH_4 + N_2O$	SiH_4/N_2O flow ratio	1100°C
Pereyra I., 1997	**$SiH_4 + N_2O$**	**SiH_4/N_2O flow ratio**	**400°C**
Alayo M., 1998	$SiH_4 + N_2O$	SiH_4/N_2O flow ratio	1000°C
Kenyon T., 1997	$SiH_4 + N_2O + Ar$	$SiH_4/N_2O/Ar$ flow ratio	1000°C
Lam D. K. W., 1984	$SiH_4 + N_2O + NH_3$	$SiH_4/N_2O/NH_3$ flow ratio	Not specified
Bruno F., 1991	$SiH_4 + N_2O + NH_3$	$SiH_4/N_2O/NH_3$ flow ratio	1100°C
Yokohama S., 1995	$SiH_4 + N_2O + NH_3$	$SiH_4/N_2O/NH_3$ flow ratio	Not specified
Agnihotri O. P., 1997	**$SiH_4 + N_2O + NH_3$**	**$SiH_4/N_2O/NH_3$ flow ratio**	**700-900°C**
Germann R., 1999	$SiH_4 + N_2O + NH_3$	Unknown	1100°C
Offrein B., 1999	$SiH_4 + N_2O + NH_3$	Unknown	1150°C
Hoffmann M., 1995	$SiH_4 + N_2O + NH_3 + Ar$	$SiH_4/N_2O/NH_3/Ar$ flow ratio	Not specified
Hoffmann M., 1997	$SiH_4 + N_2O + NH_3 + Ar$	$SiH_4/N_2O/NH_3/Ar$ flow ratio	Not specified
Tu Y., 1995	$SiH_4 + N_2O + NH_3 + N_2$	$N_2O/(N_2O + NH_3)$ flow ratio	1050°C
Poenar D., 1997	$SiH_4 + N_2O + NH_3 + N_2$	$SiH_4/N_2O/NH_3/N_2$ flow ratio	850°C
Ridder R., 1998	$SiH_4 + N_2O + NH_3 + N_2$	$SiH_4/N_2O/NH_3/Ar$ flow ratio	1100°C
Worhoff.,K 1999	$SiH_4 + N_2O + NH_3 + N_2$	$SiH_4/N_2O/NH_3/N_2$ flow ratio	1150°C
Bulat E.S., 1993	**$SiH_4 + N_2O + N_2 + O_2 + He + CF_4$**	**$SiH_4/(N_2O/N_2)/O_2/CF_4$ flow ratio**	**425°C**
This Patent Application	**$SiH_4 + N_2O + PH_3 + N_2$**	**Patented Pending Method**	**650°C**

FIG. 1

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	HO-H	SiO-H	SiN-H	Si:N-H	Si-H	Si=O	N=N	Si-O-Si	Si-O-Si	Si-ON	Si-OH	Si-O-Si	Si-O-Si
Min	**3550**	**3470**	**3380**	**3300**	**2210**	**1800**	**1530**	**1080**	**1000**	**910**	**860**	**740**	**410**
Ave	**3650**	**3510**	**3420**	**3380**	**2260**	**1875**	**1555**	**1180**	**1080**	**950**	**885**	**810**	**460**
Max	**3750**	**3550**	**3460**	**3460**	**2310**	**1950**	**1580**	**1280**	**1160**	**990**	**910**	**880**	**510**
Min	2.817	2.882	2.959	3.030	4.525	5.556	6.536	9.259	10.000	10.989	11.628	13.514	24.390
Ave	2.740	2.849	2.924	2.959	4.425	5.333	6.431	8.475	9.256	10.526	11.299	12.346	21.739
Max	2.667	2.817	2.890	2.890	4.329	5.128	6.329	7.813	8.621	10.101	10.989	11.364	19.608
Min	**1.408**	**1.441**	**1.479**	**1.515**	2.262	2.778	3.268	4.630	5.000	5.495	5.814	6.757	12.195
Ave	**1.370**	**1.425**	**1.462**	**1.479**	2.212	2.667	3.215	4.237	4.630	5.263	5.650	6.173	10.870
Max	**1.333**	**1.408**	**1.445**	**1.445**	2.165	2.564	3.165	3.906	4.310	5.051	5.495	5.682	9.804
Min	0.939	0.961	0.986	1.010	**1.508**	1.852	2.179	3.086	3.333	3.663	3.876	4.505	8.130
Ave	0.913	0.950	0.975	0.986	**1.475**	1.778	2.144	2.825	3.086	3.509	3.766	4.115	7.246
Max	0.889	0.939	0.963	0.963	**1.443**	1.709	2.110	2.604	2.874	3.367	3.663	3.788	6.536
Min	0.704	0.720	0.740	0.758	1.131	**1.389**	1.634	2.315	2.500	2.747	2.907	3.378	6.098
Ave	0.685	0.712	0.731	0.740	1.106	**1.333**	1.608	2.119	2.315	2.632	2.825	3.086	5.435
Max	0.667	0.704	0.723	0.723	1.082	1.282	1.582	1.953	2.155	2.525	2.747	2.841	4.902
Min	0.563	0.576	0.592	0.606	0.905	1.111	**1.307**	1.852	2.000	2.198	2.326	2.703	4.878
Ave	0.548	0.570	0.585	0.592	0.885	1.067	1.286	1.695	1.852	2.105	2.260	2.469	4.348
Max	0533	0.563	0.578	0.578	0.866	1.026	1.266	1.563	1.724	2.020	2.198	2.273	3.922
Min	0.469	0.480	0.493	0.505	0.754	0.926	1.089	**1.543**	1.667	1.832	1.938	2.252	4.065
Ave	0.457	0.475	0.487	0.493	0.737	0.889	1.072	**1.412**	1.543	1.754	1.883	2.058	3.623
Max	0.444	0.469	0.482	0.482	0.722	0.855	1.055	**1.302**	1.437	1.684	1.832	1.894	3.268
Min	0.402	0.412	0.423	0.433	0.646	0.794	0.934	**1.323**	1.429	1.570	1.661	1.931	3.484
Ave	0.391	0.407	0.418	0.423	0.632	0.762	0.919	1.211	1.323	**1.504**	1.614	1.764	3.106
Max	0.381	0.402	0.413	0.413	0.618	0.733	0.904	1.116	1.232	**1.443**	1.570	1.623	2.801
Min	0.352	0.360	0.370	0.379	0.566	0.694	0.817	1.157	1.250	**1.374**	**1.453**	1.689	3.049
Ave	0.342	0.356	0.365	0.370	0.553	0.667	0.804	1.059	1.157	**1.316**	**1.412**	**1.543**	2.717
Max	0.333	0.352	0.361	0.361	0.541	0.641	0.791	0.977	1.078	1.263	**1.374**	**1.420**	2.451

FIG. 2

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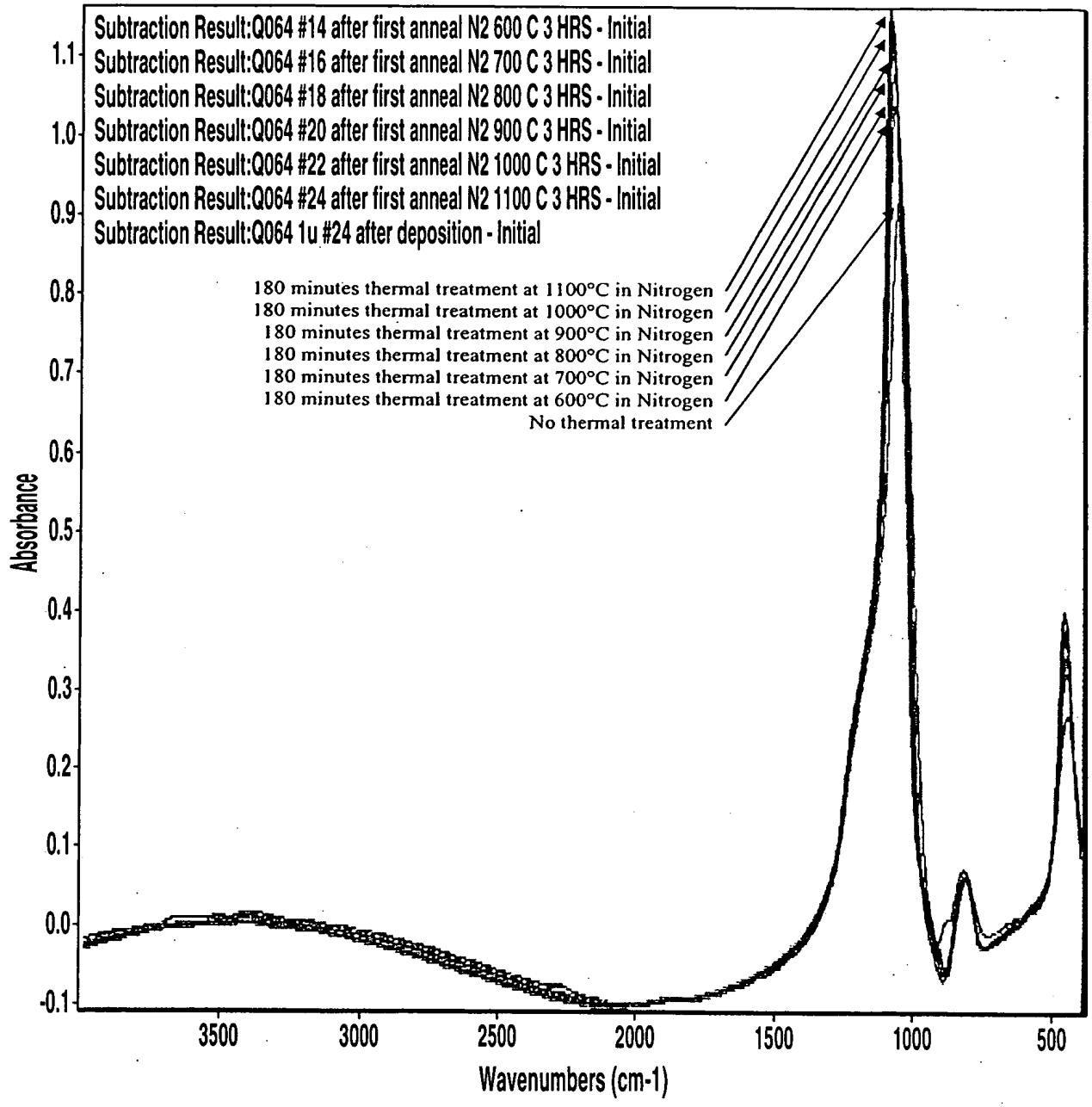

FIG. 3a

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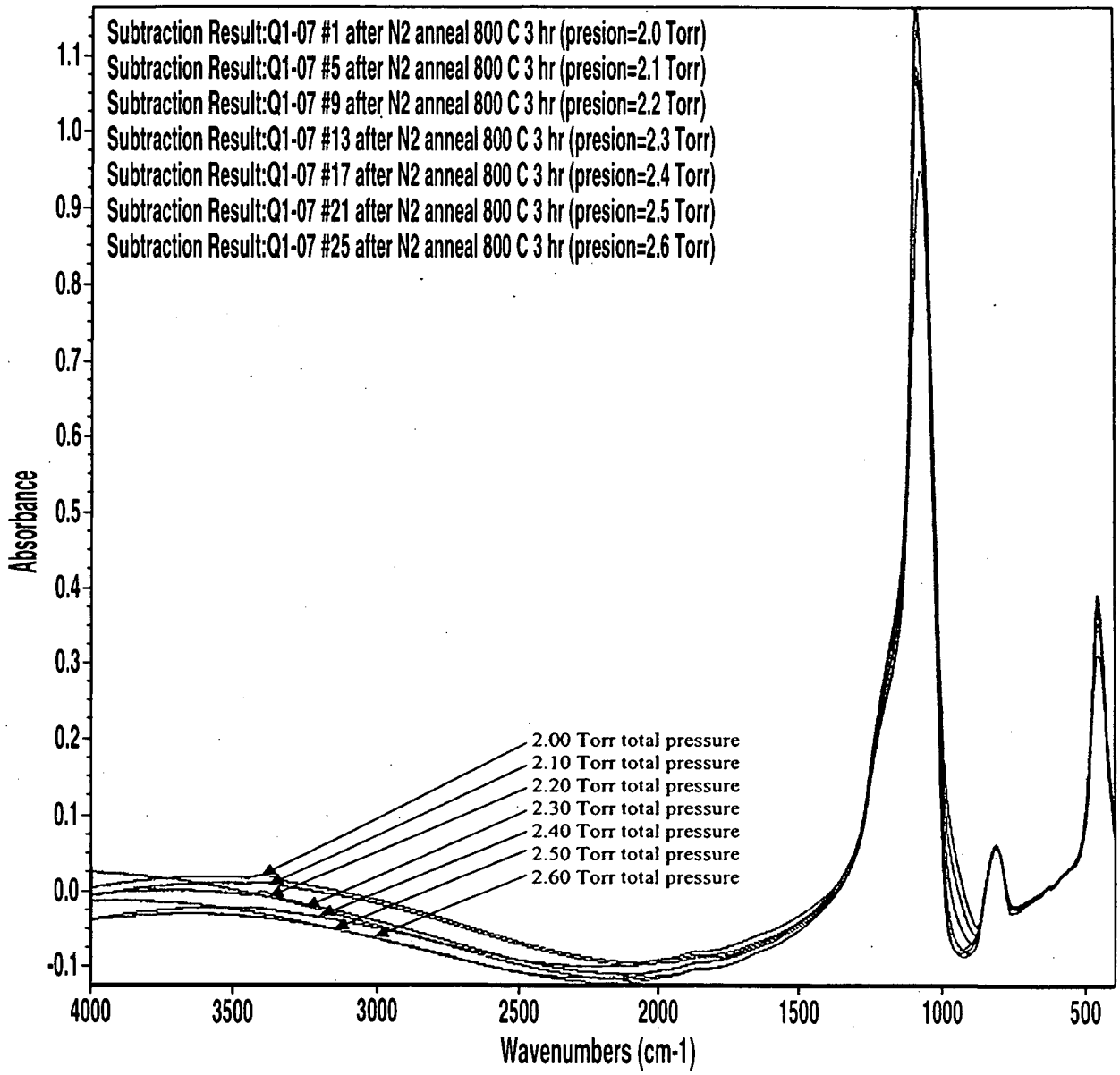

FIG. 3b

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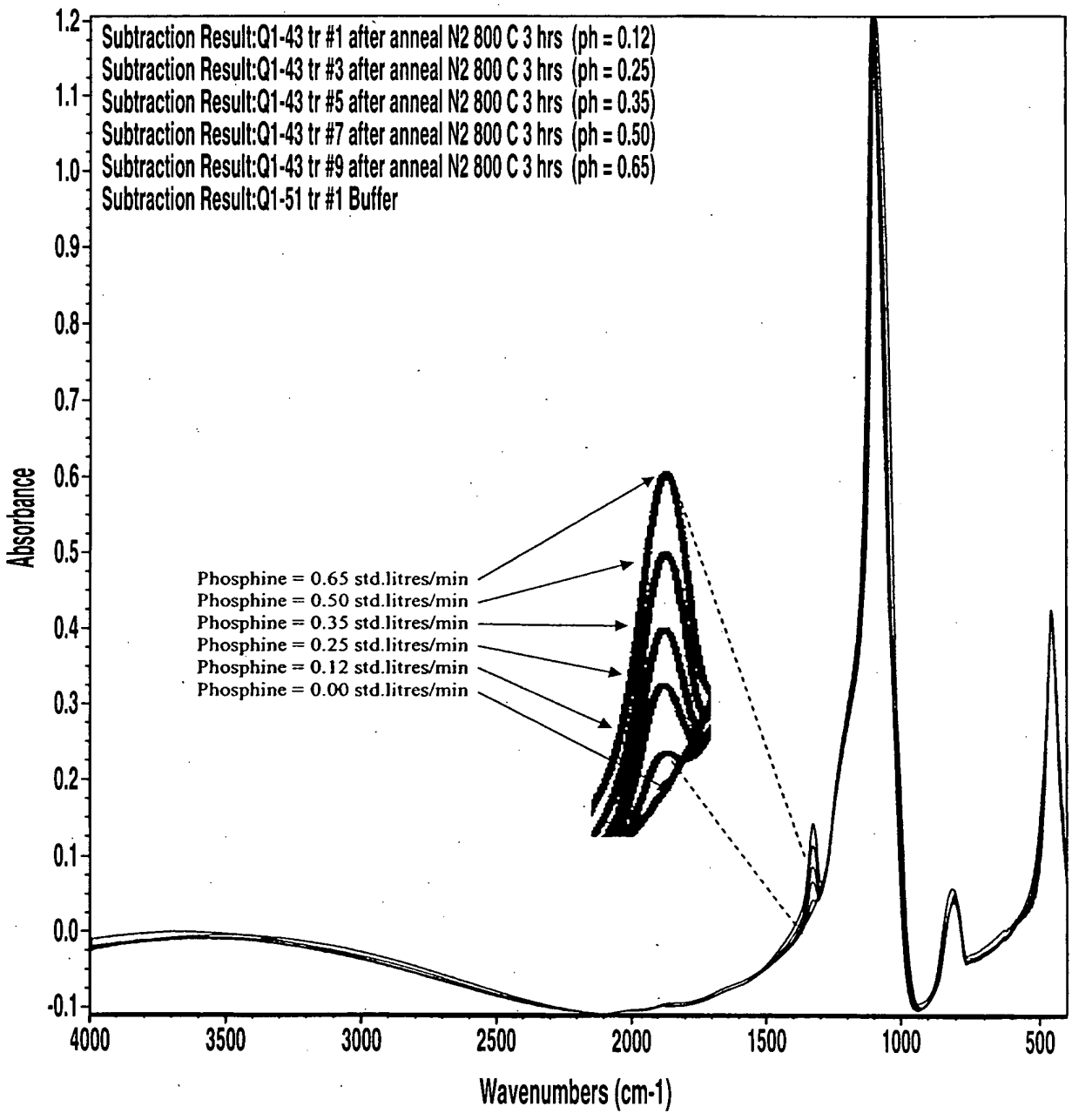

FIG. 3c

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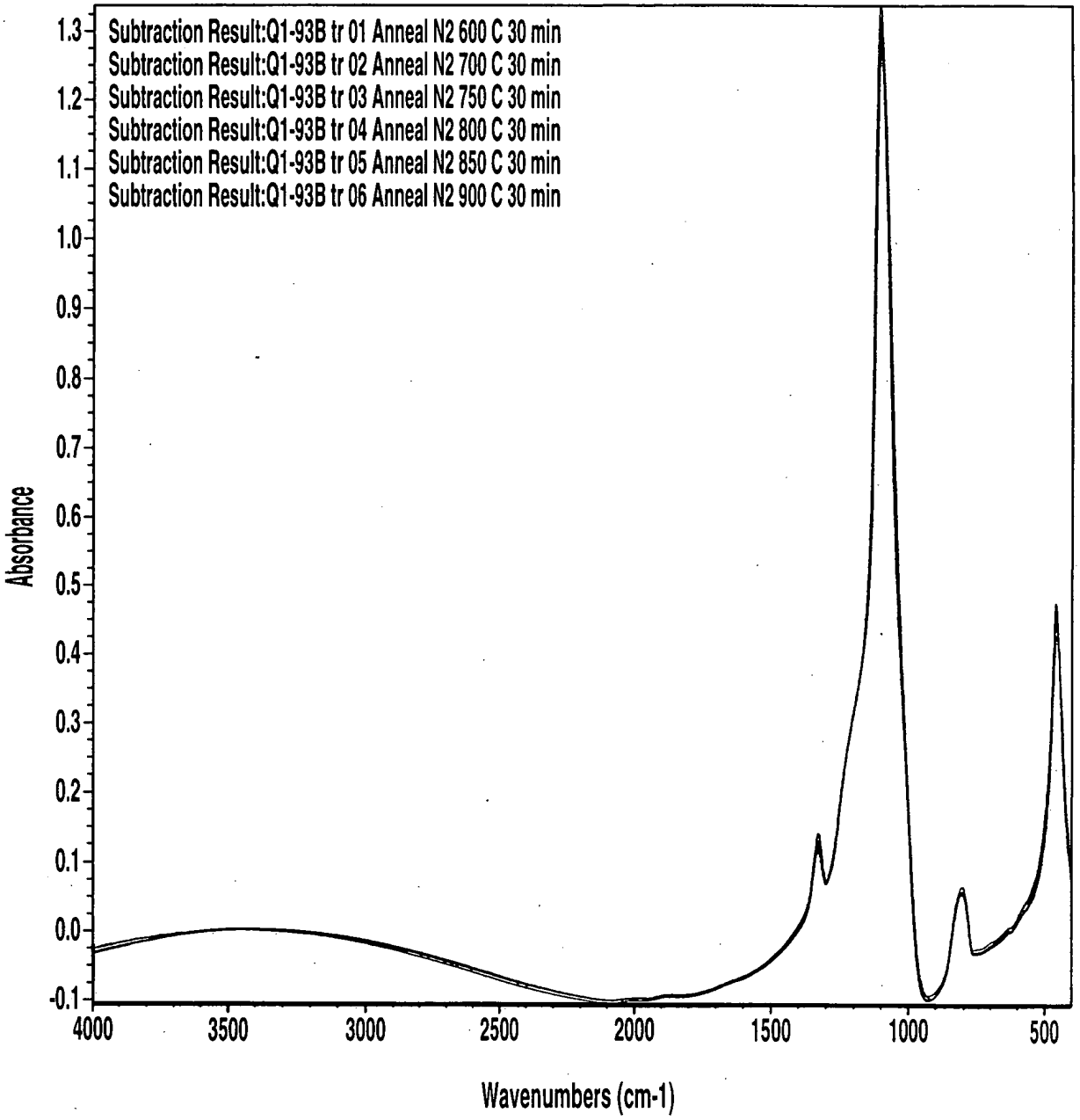

FIG. 3d

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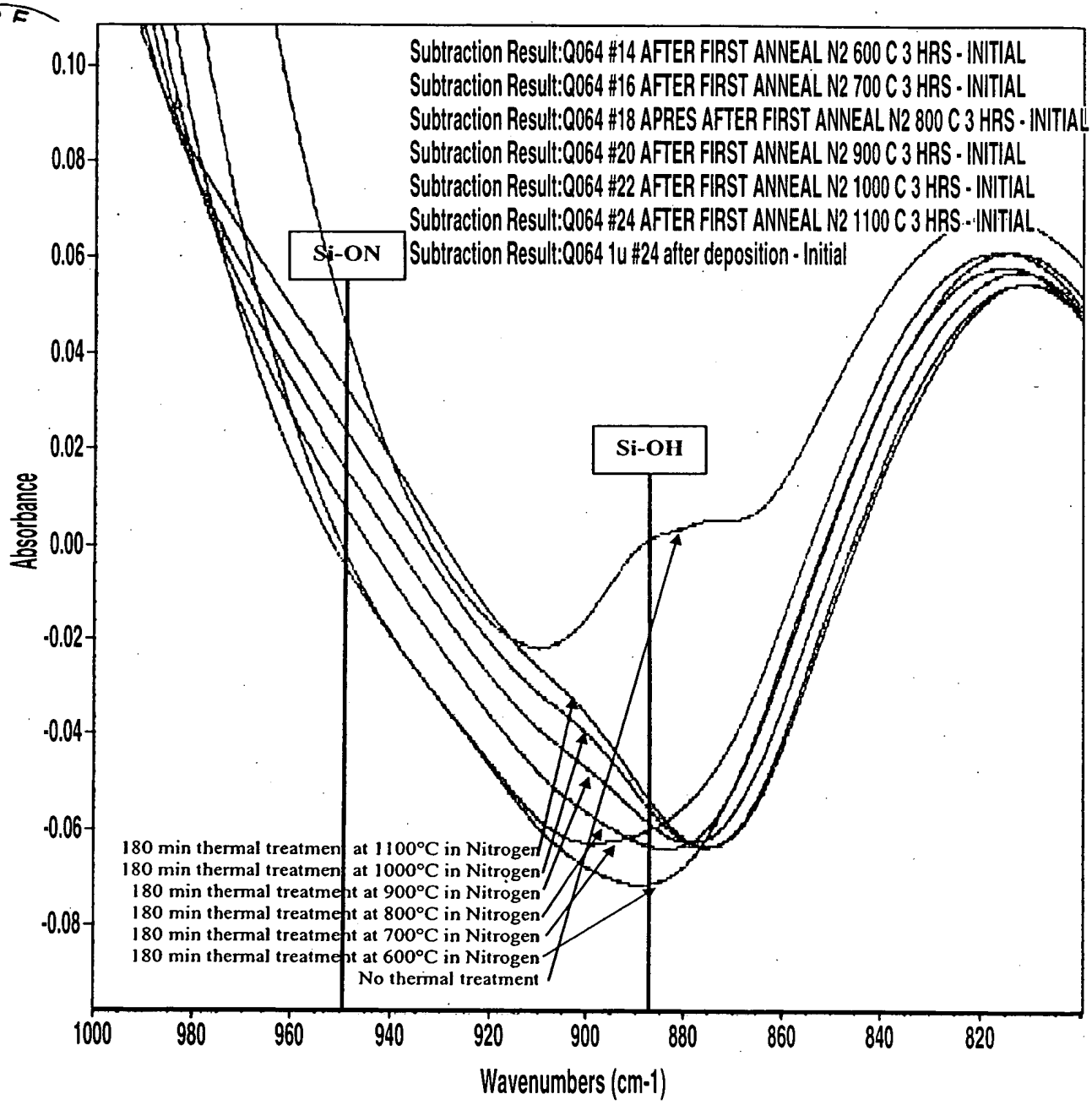

FIG. 4a

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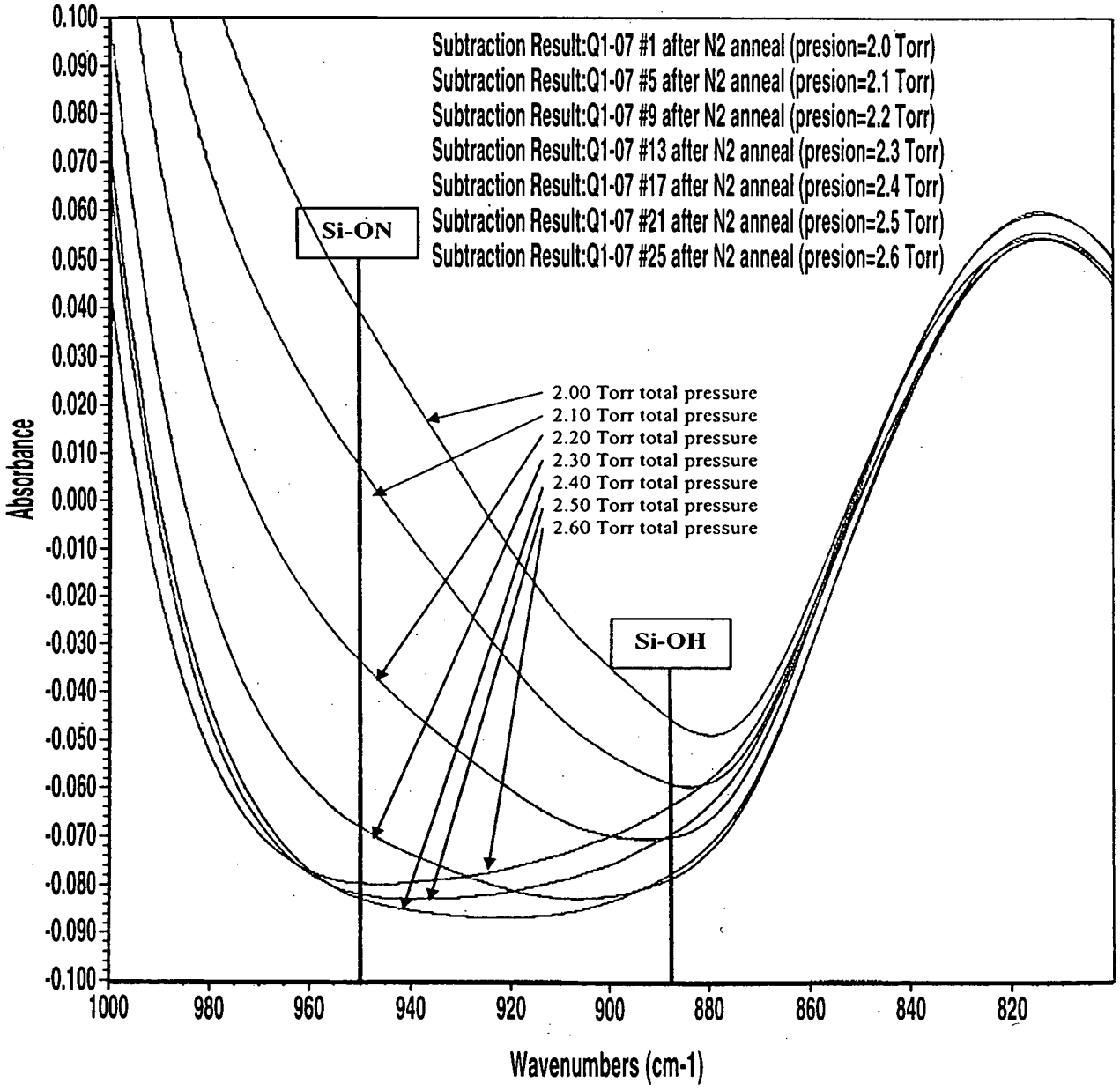

FIG. 4b

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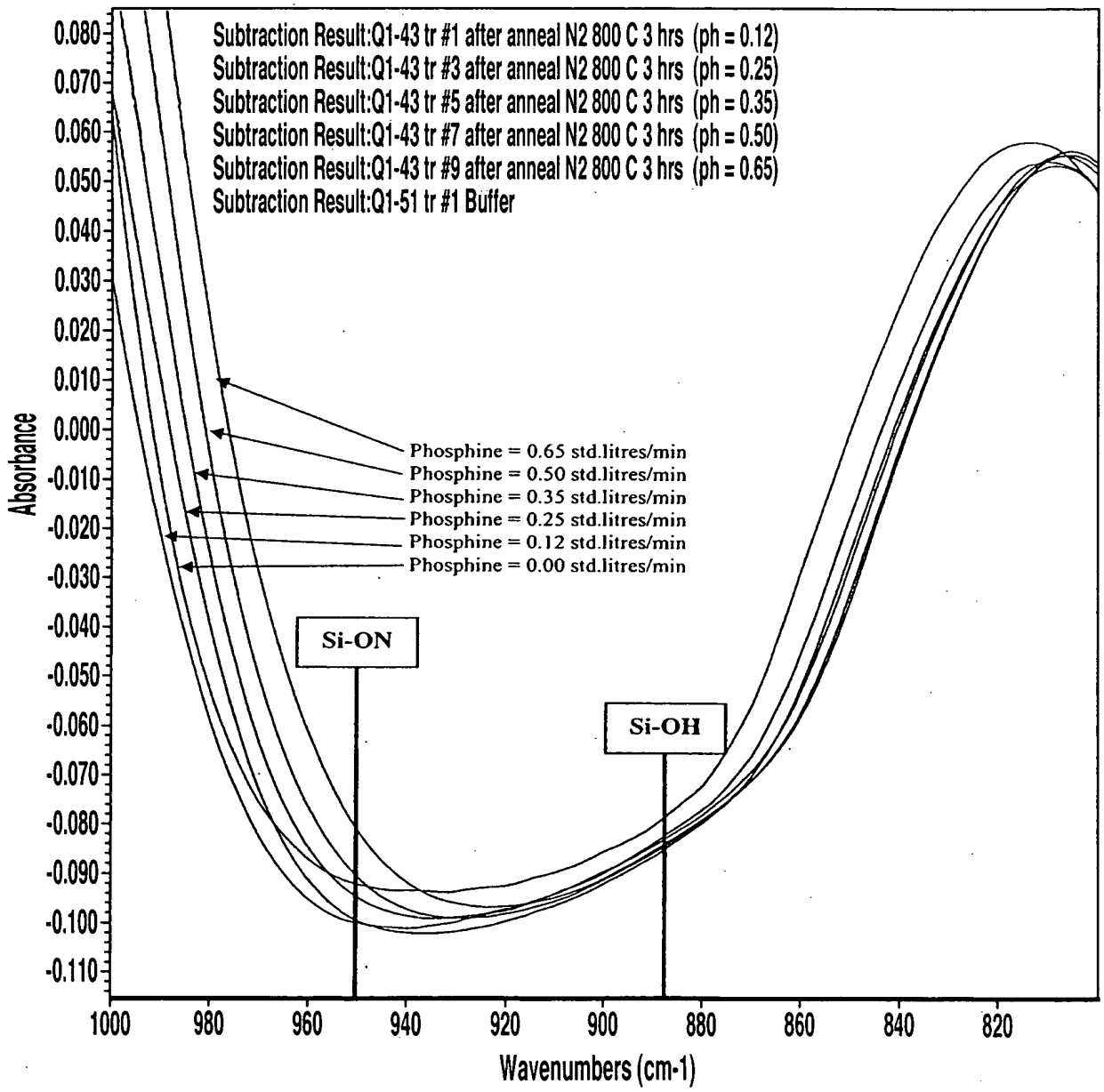

FIG. 4c

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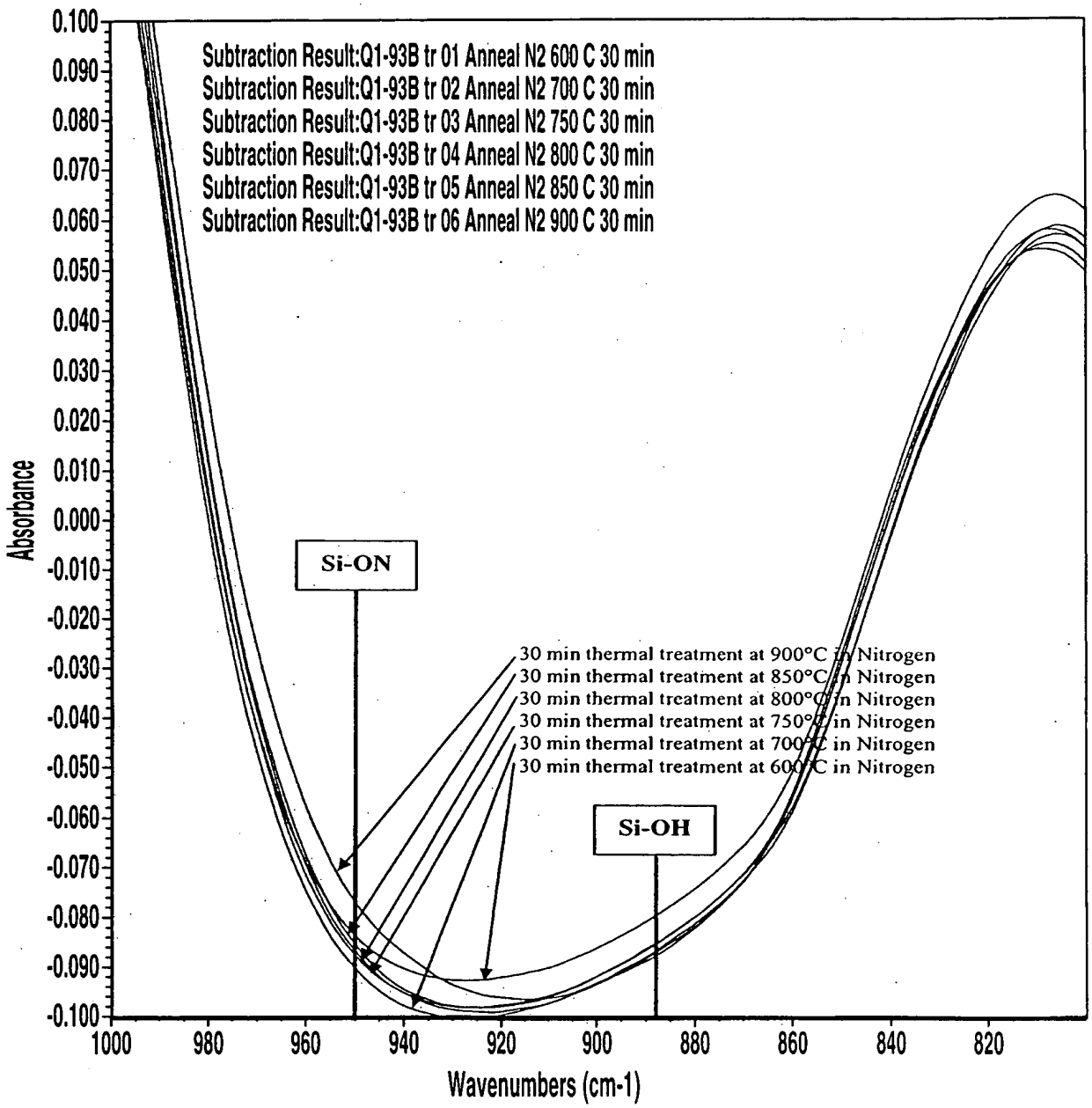

FIG. 4d

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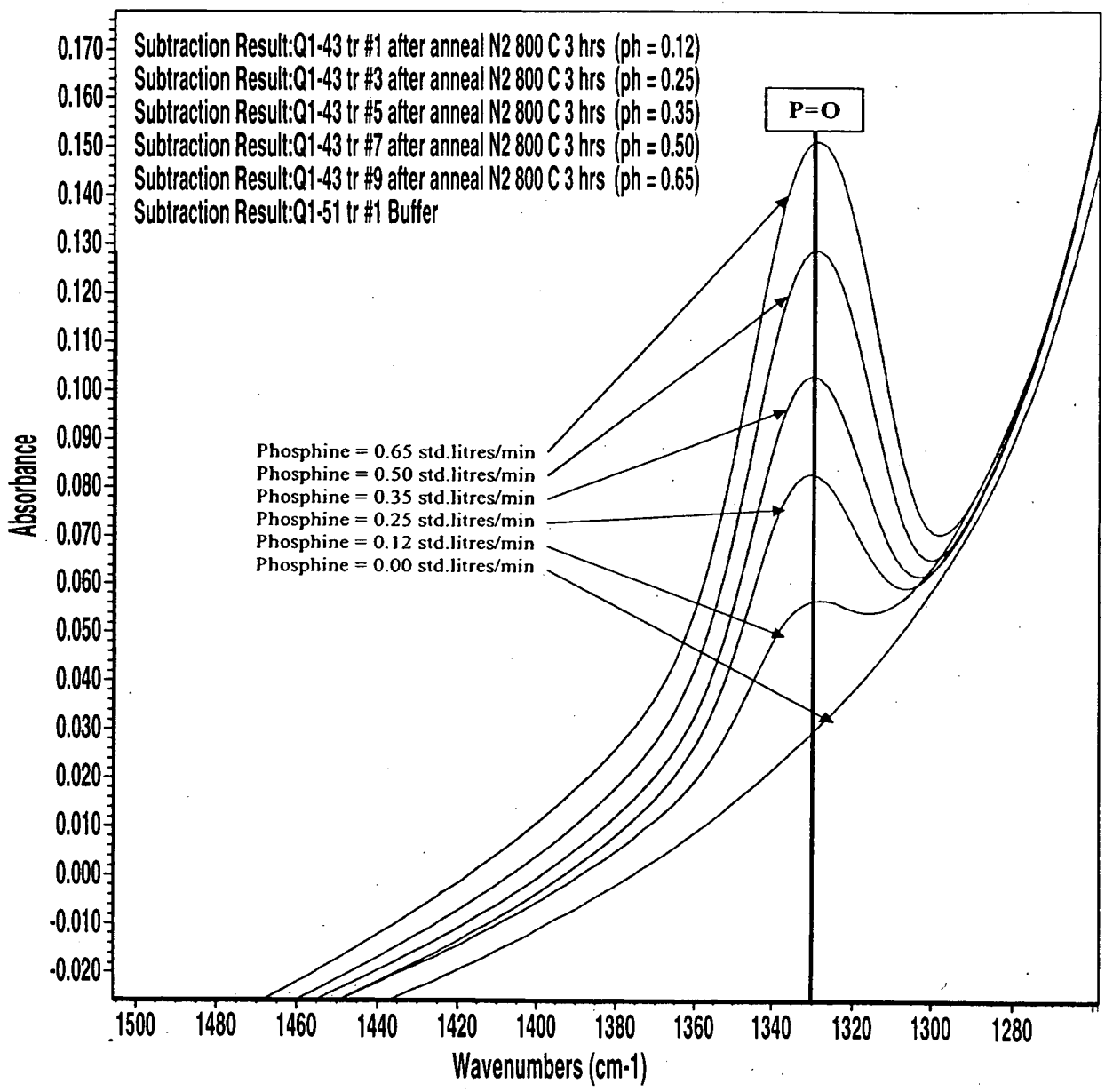

FIG. 5c

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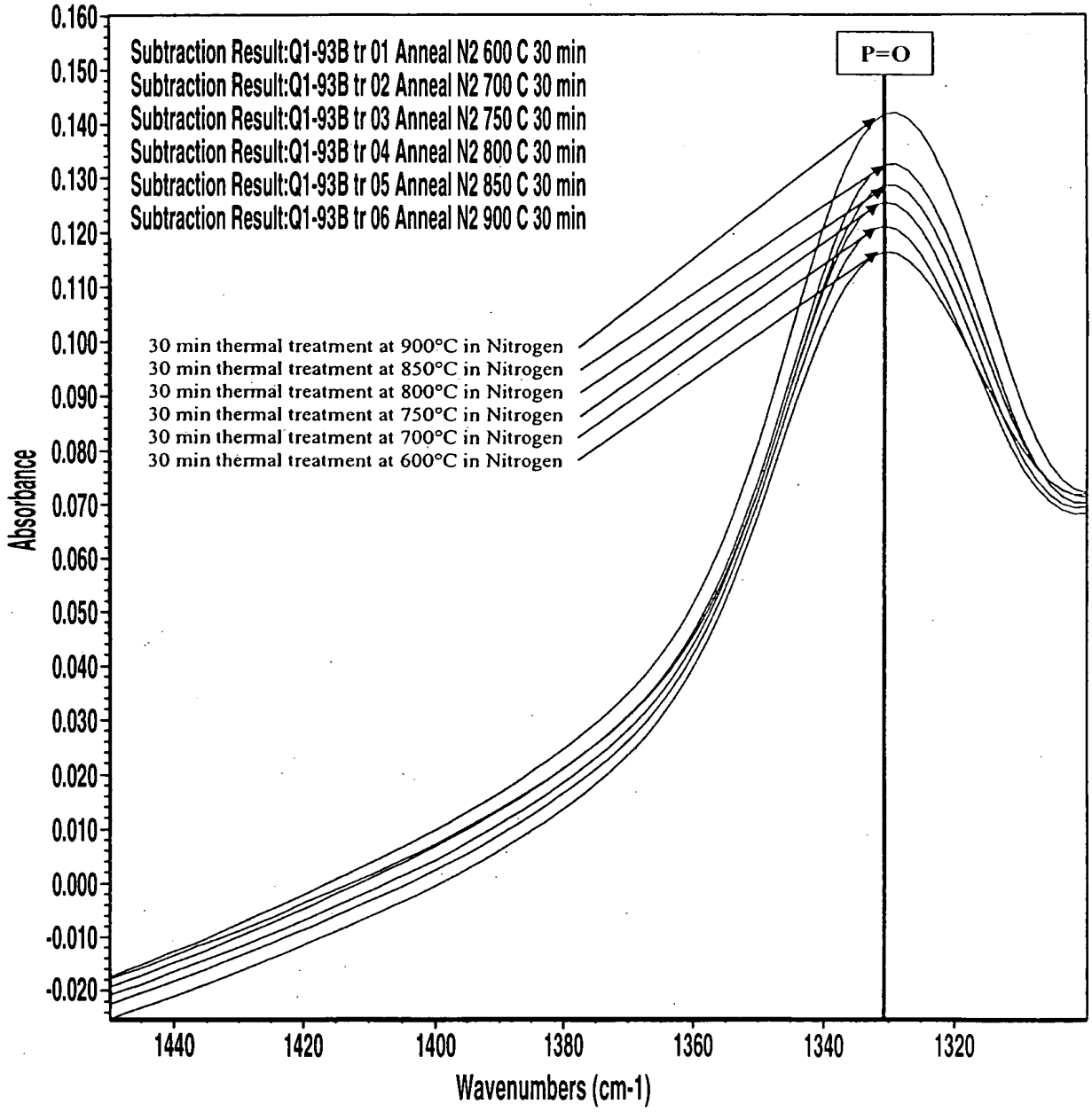

FIG. 5d

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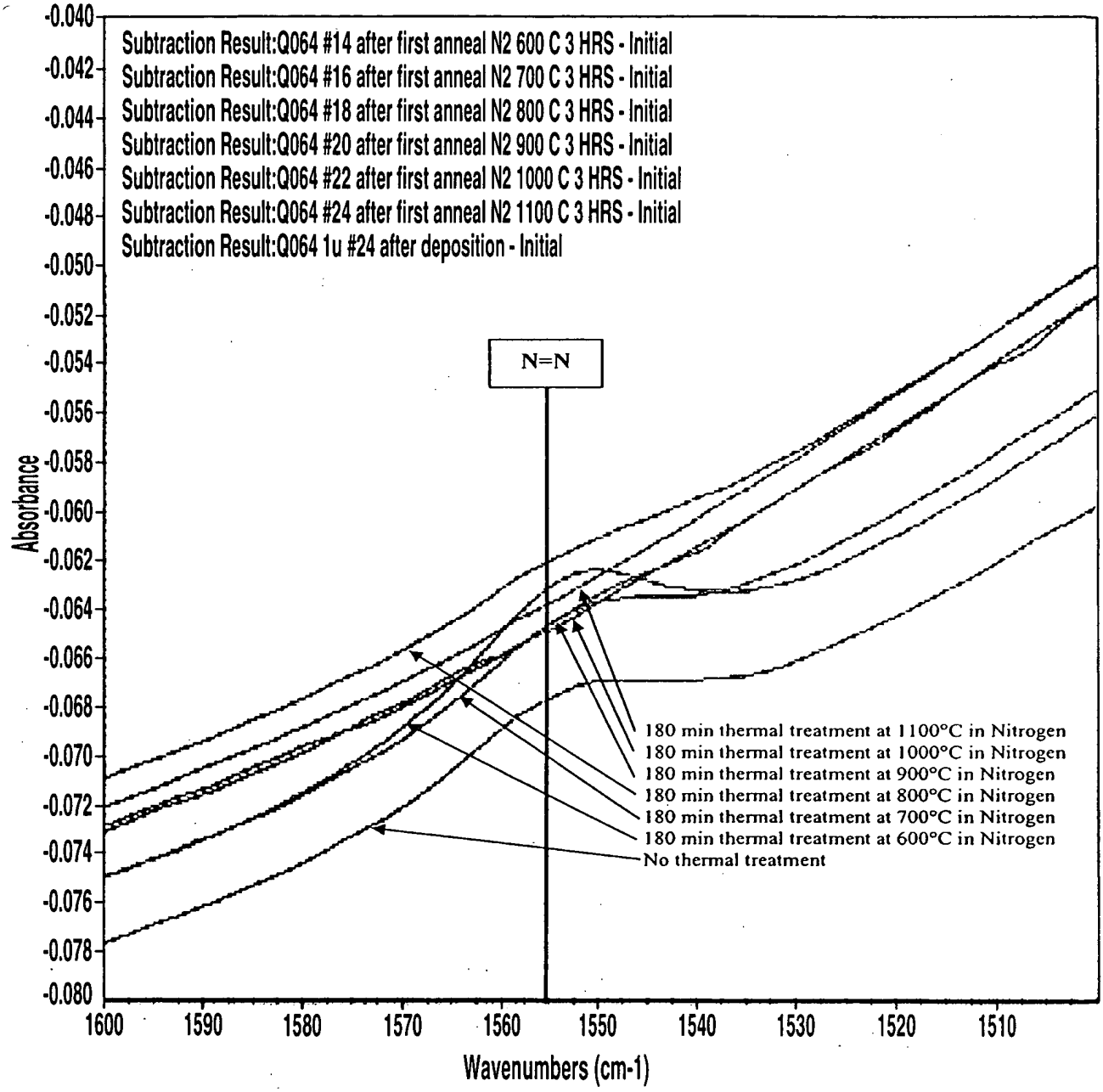

FIG. 6a

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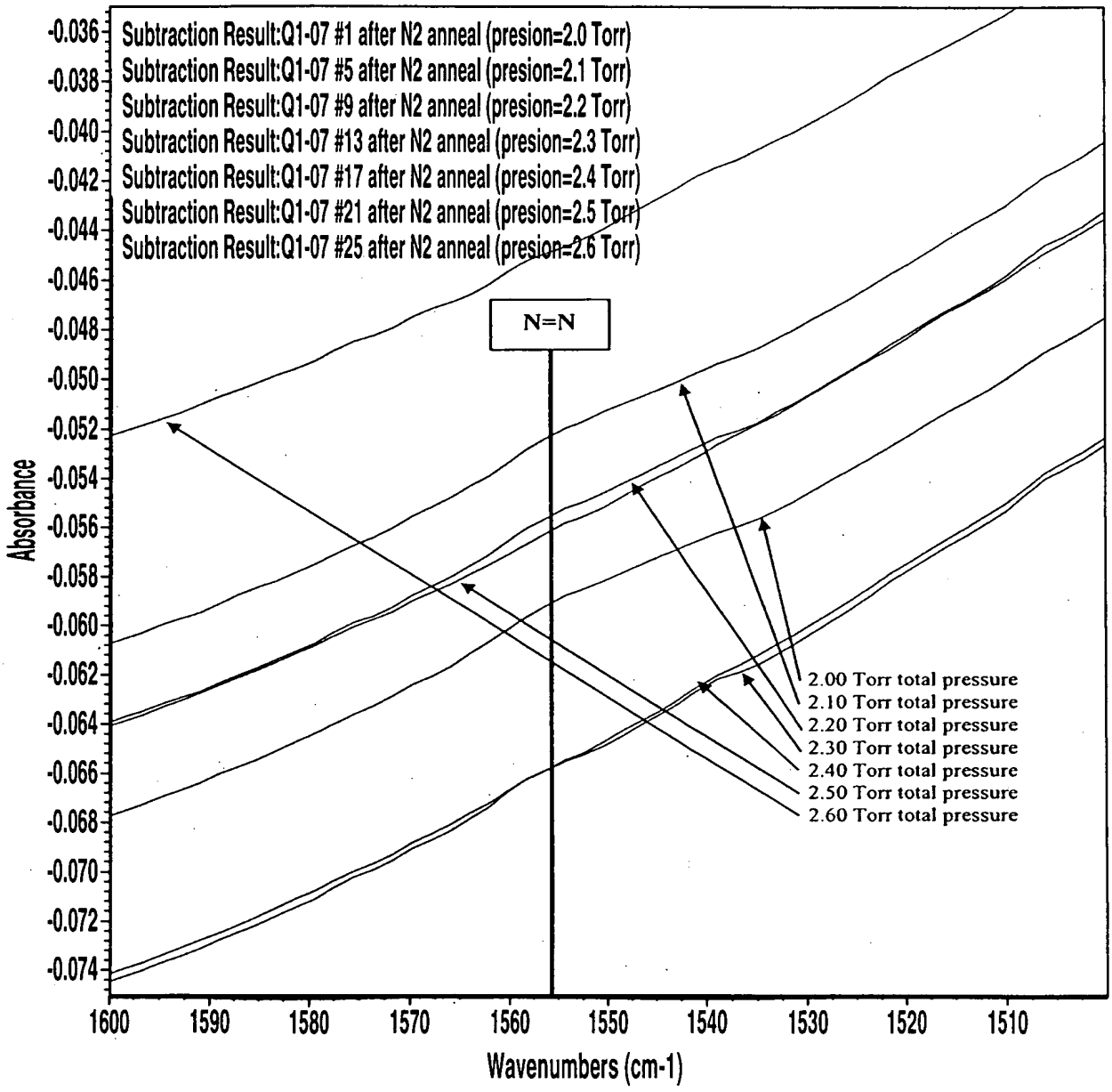

FIG. 6b

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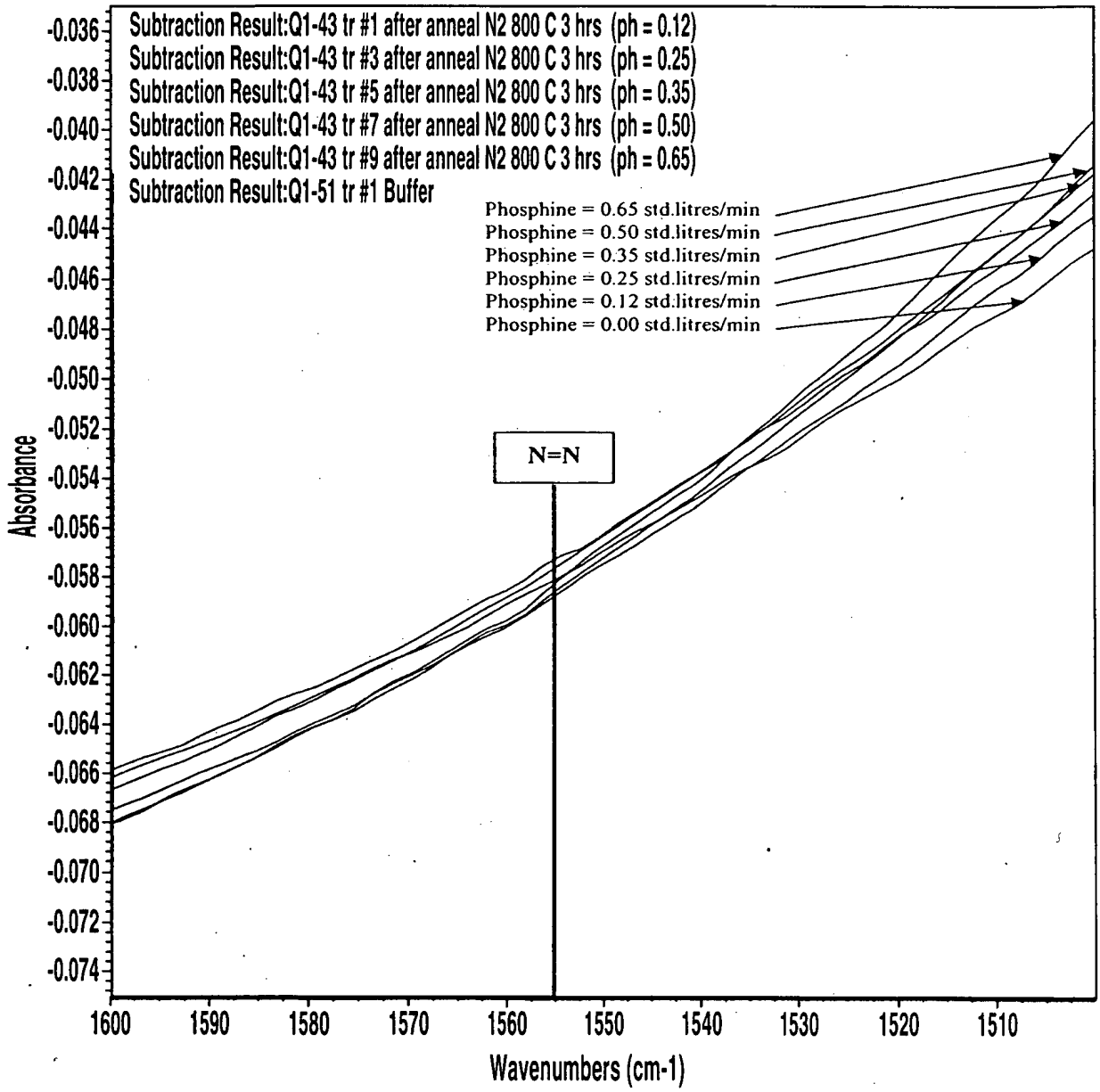

FIG. 6c

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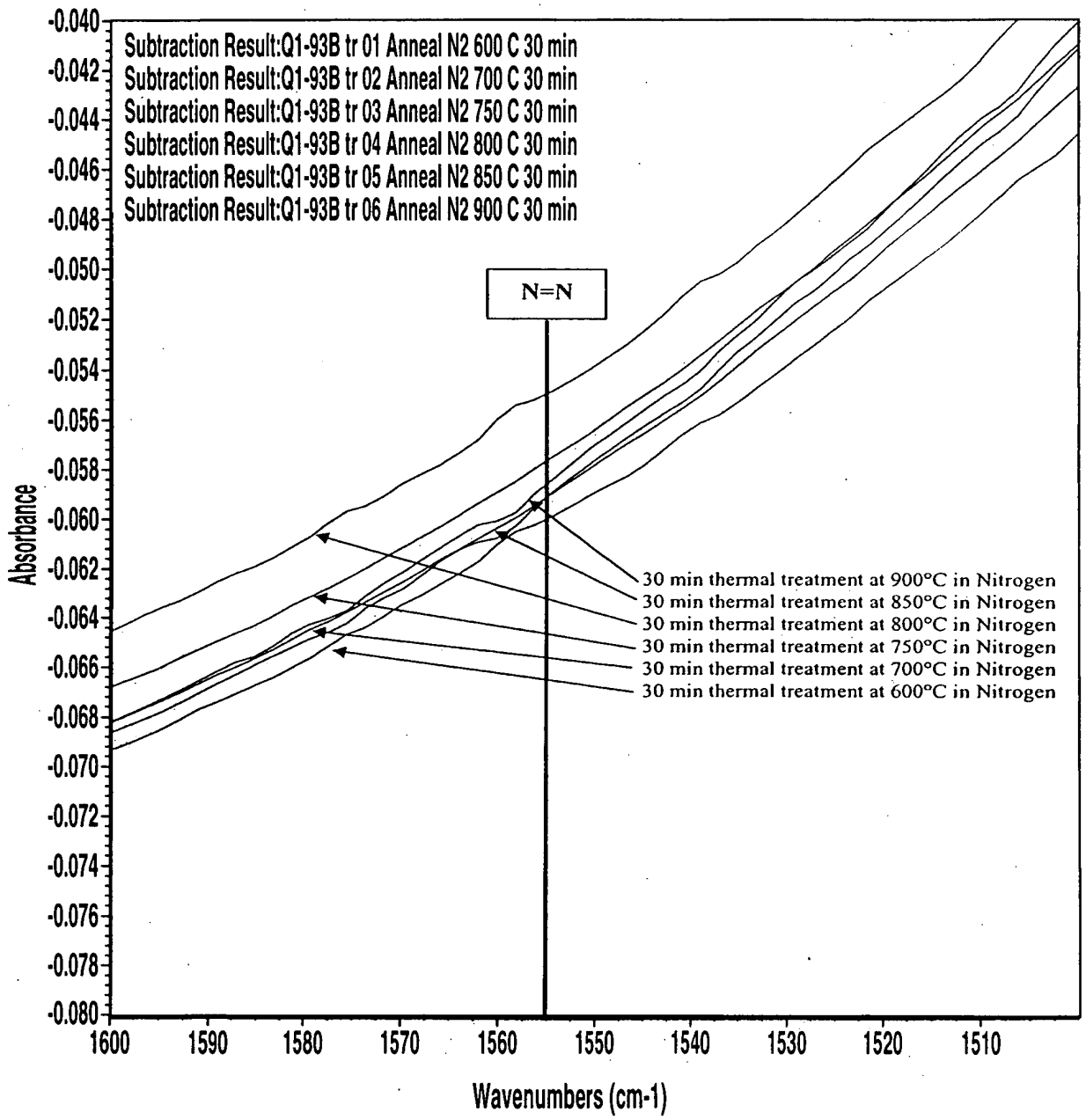

FIG. 6d

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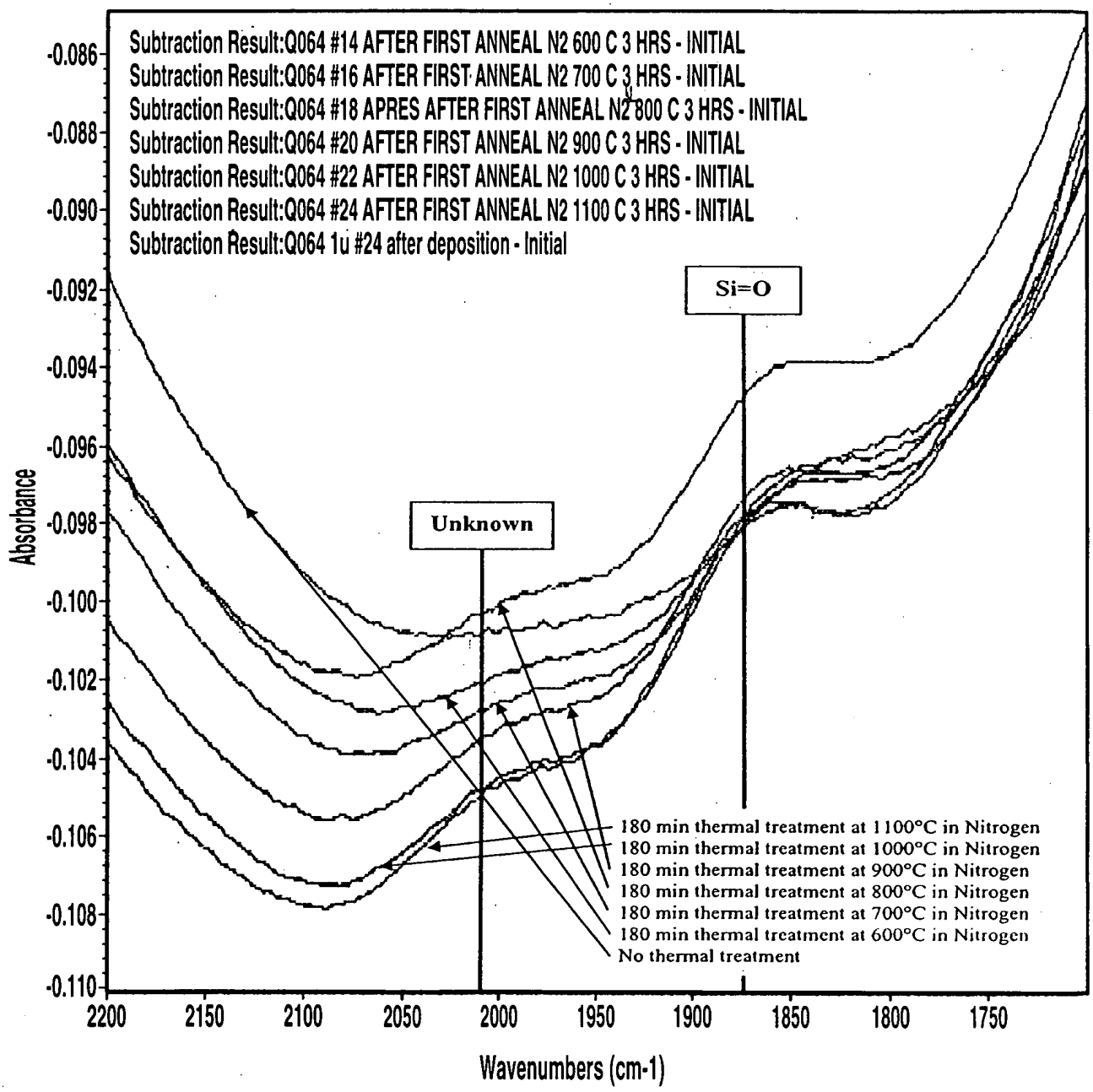

FIG. 7a

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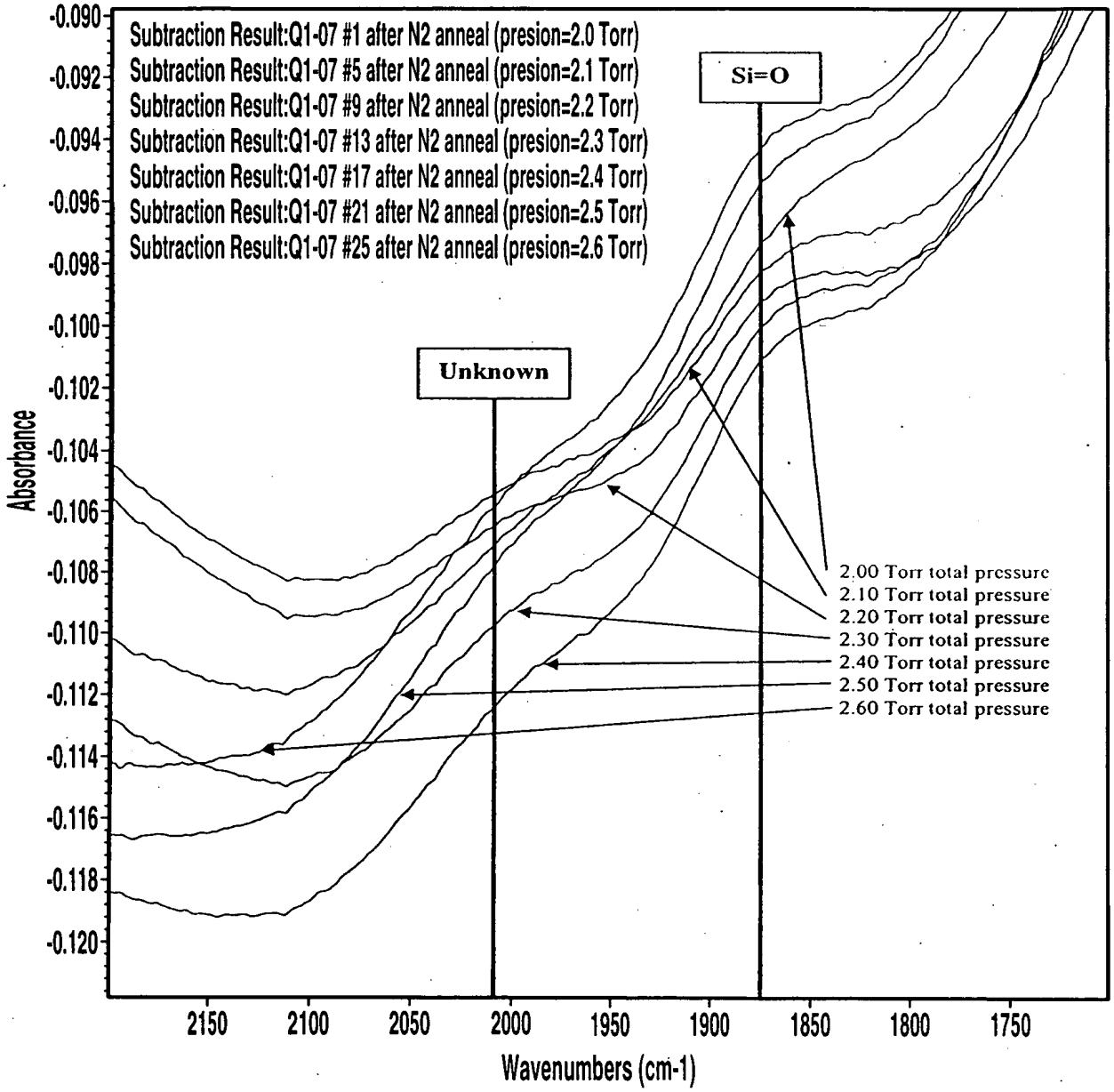

FIG. 7b

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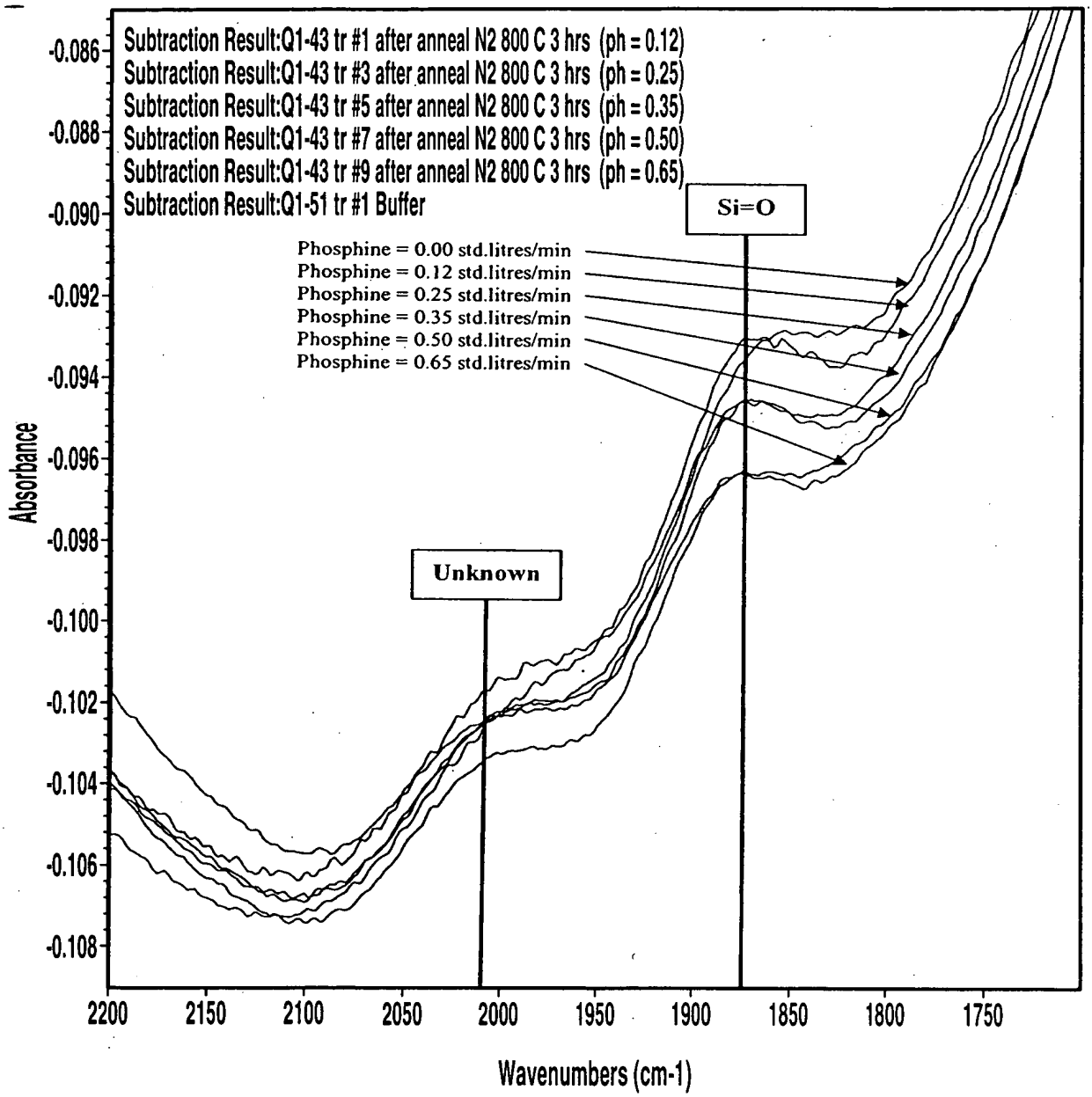

FIG. 7c

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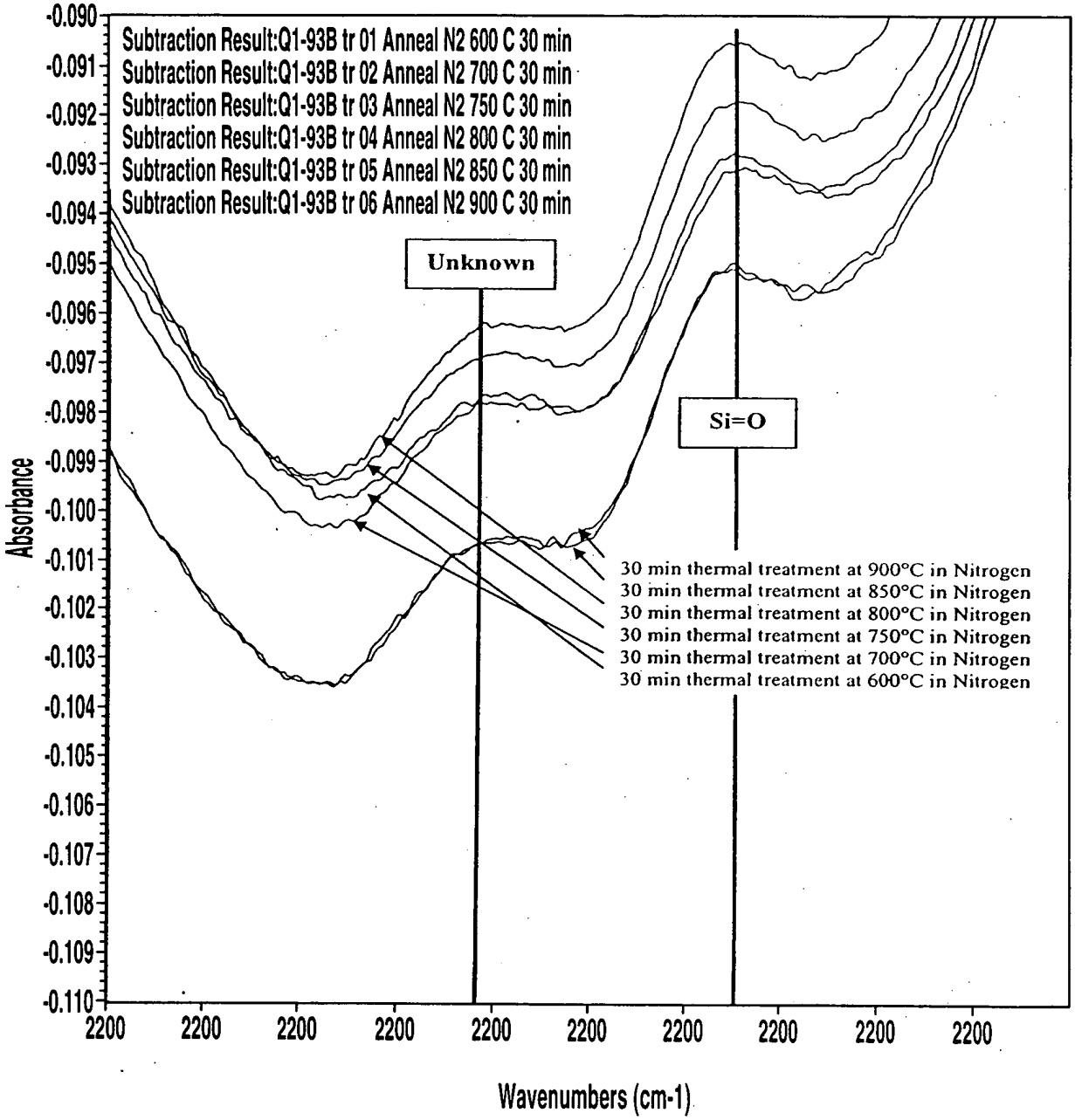

FIG. 7d

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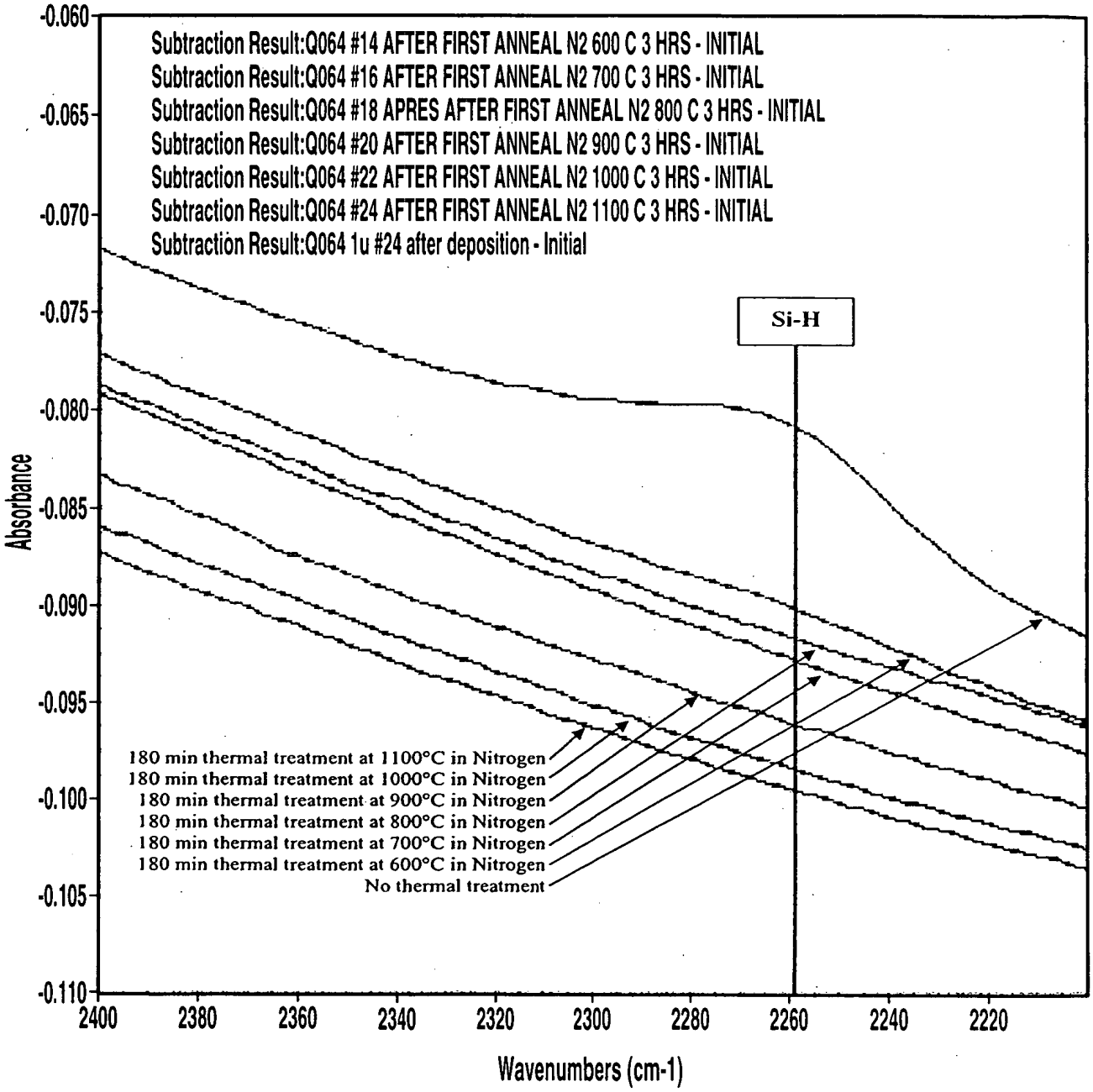

FIG. 8a

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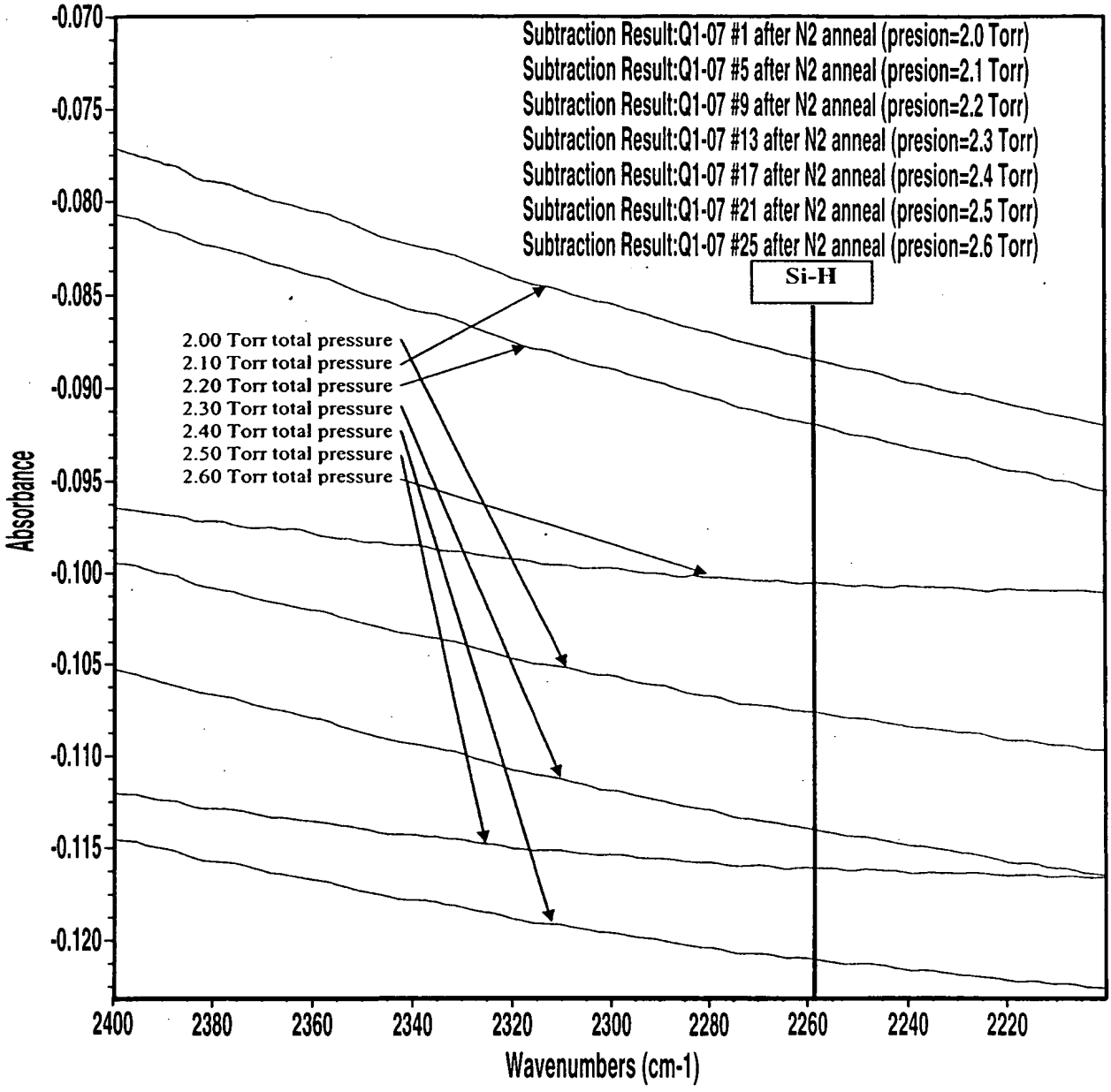

FIG. 8b

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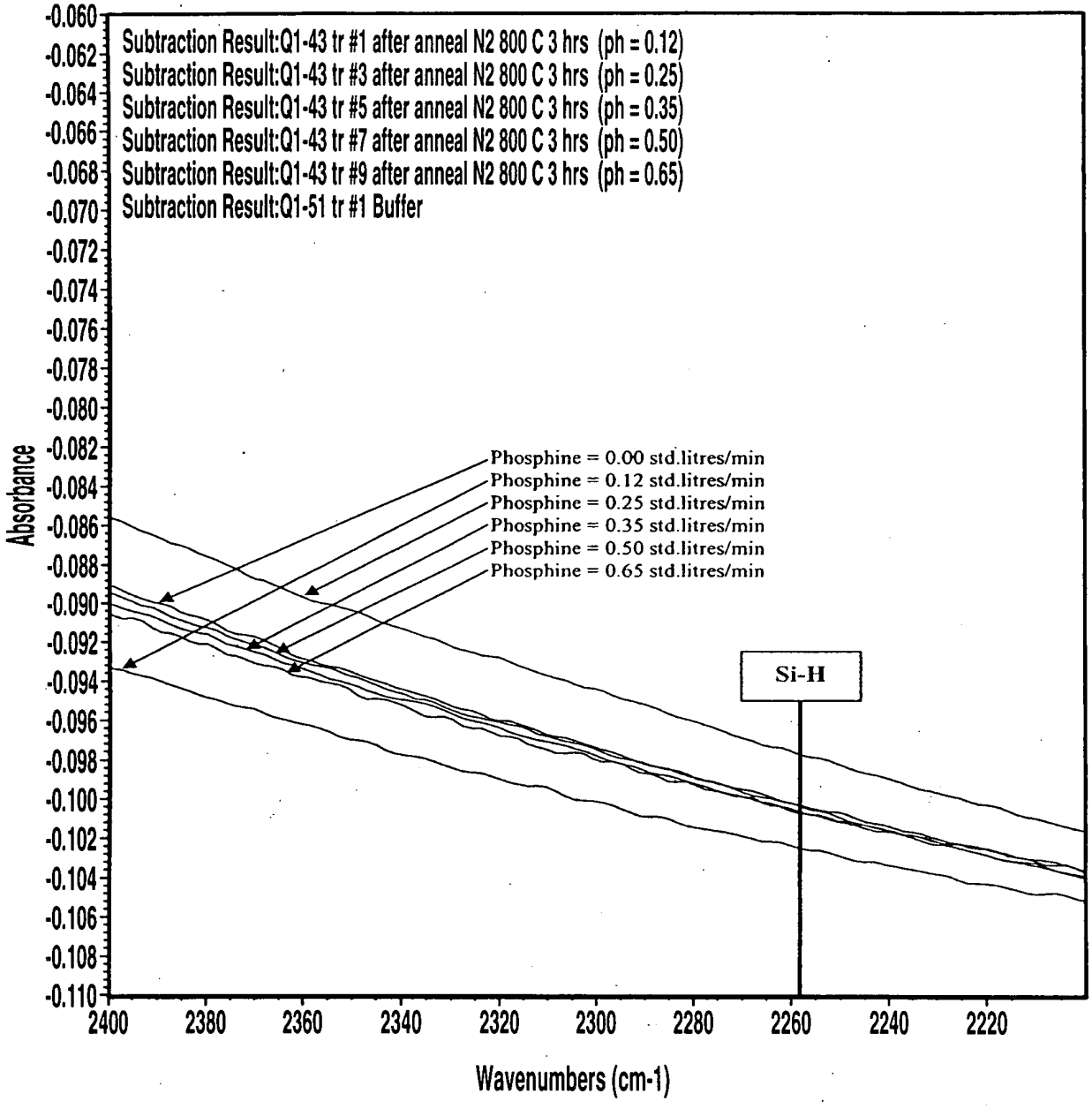

FIG. 8c

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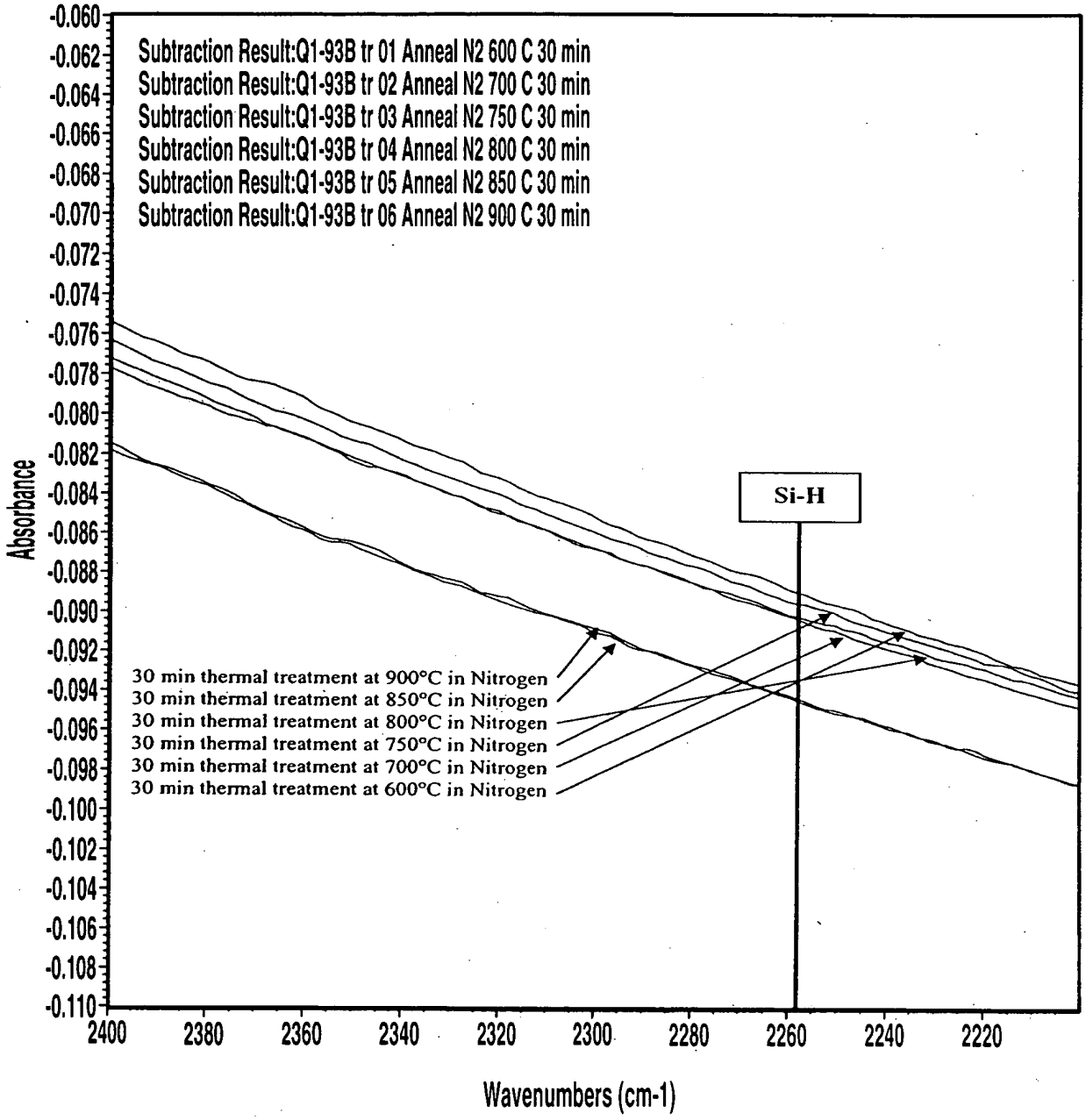

FIG. 8d

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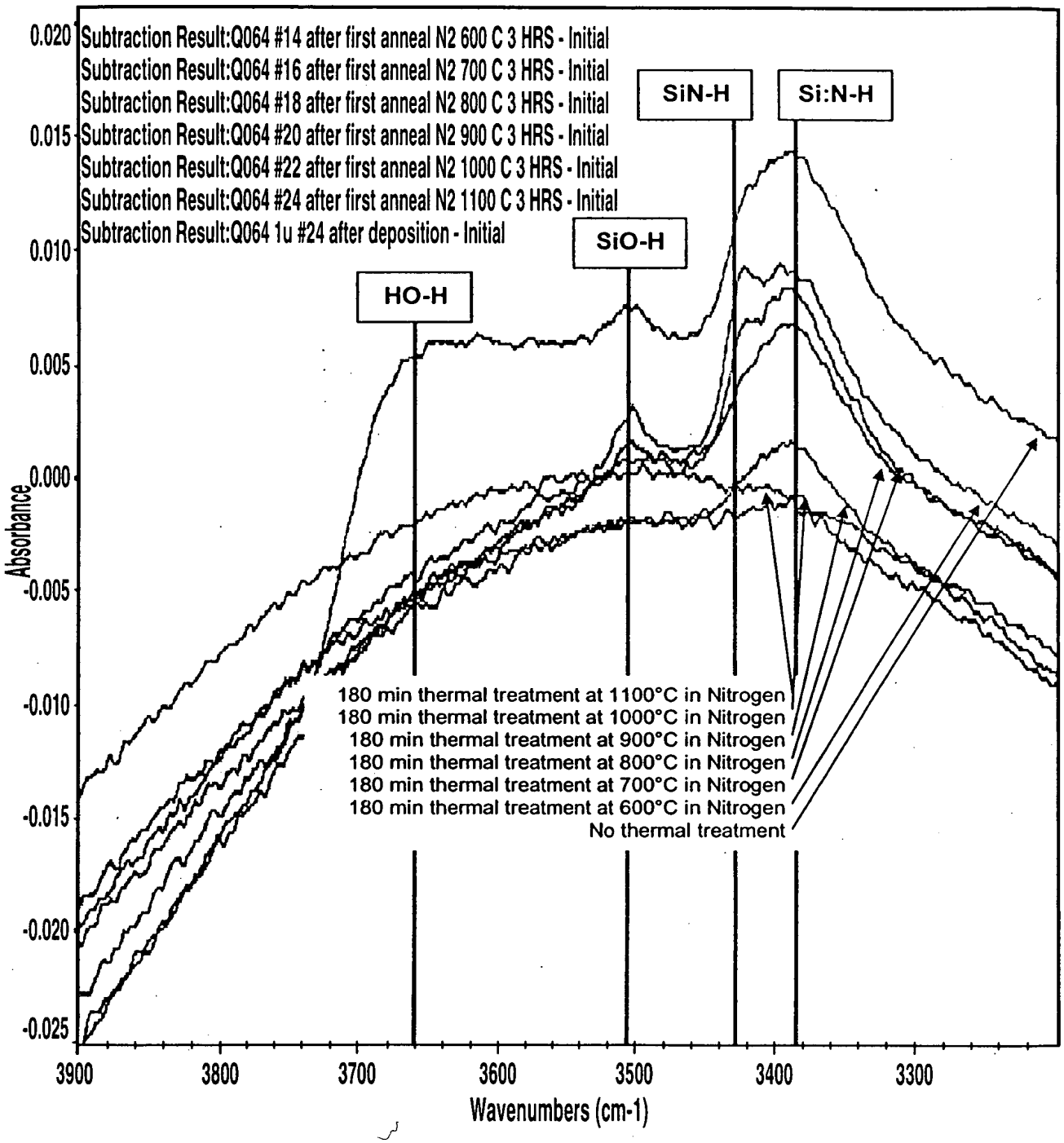

FIG. 9a

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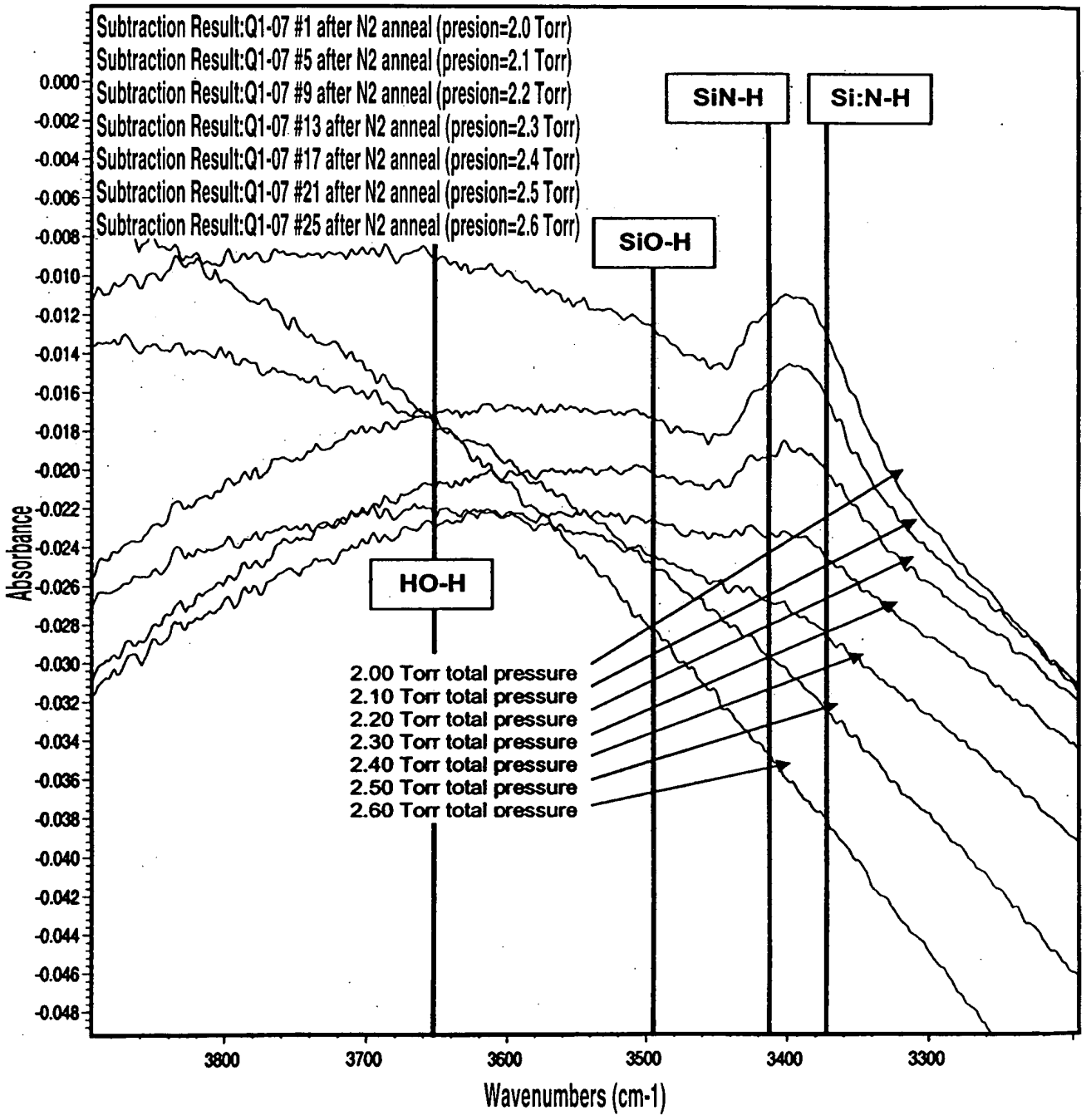

FIG. 9b

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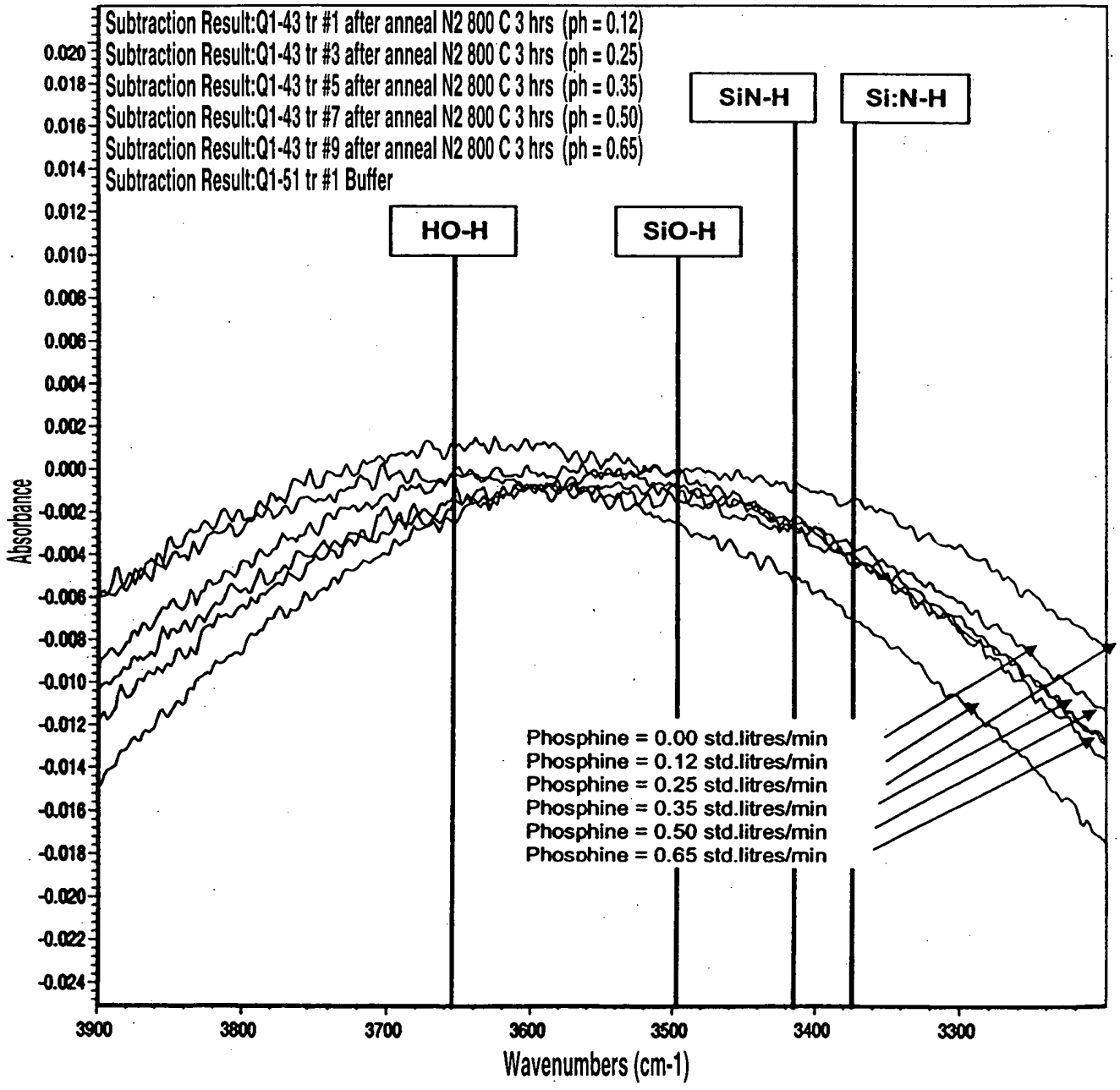

FIG. 9c

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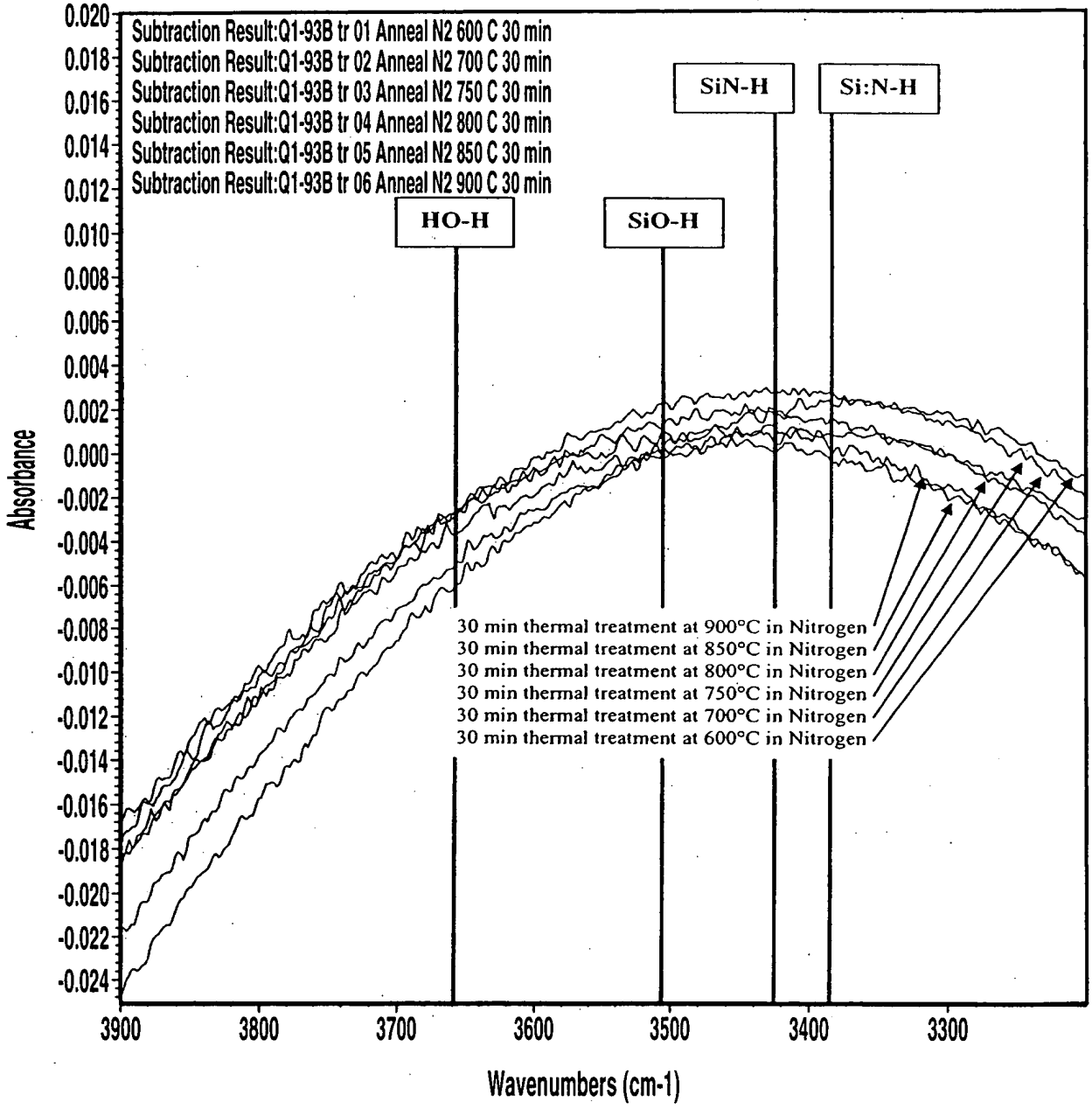

FIG. 9d

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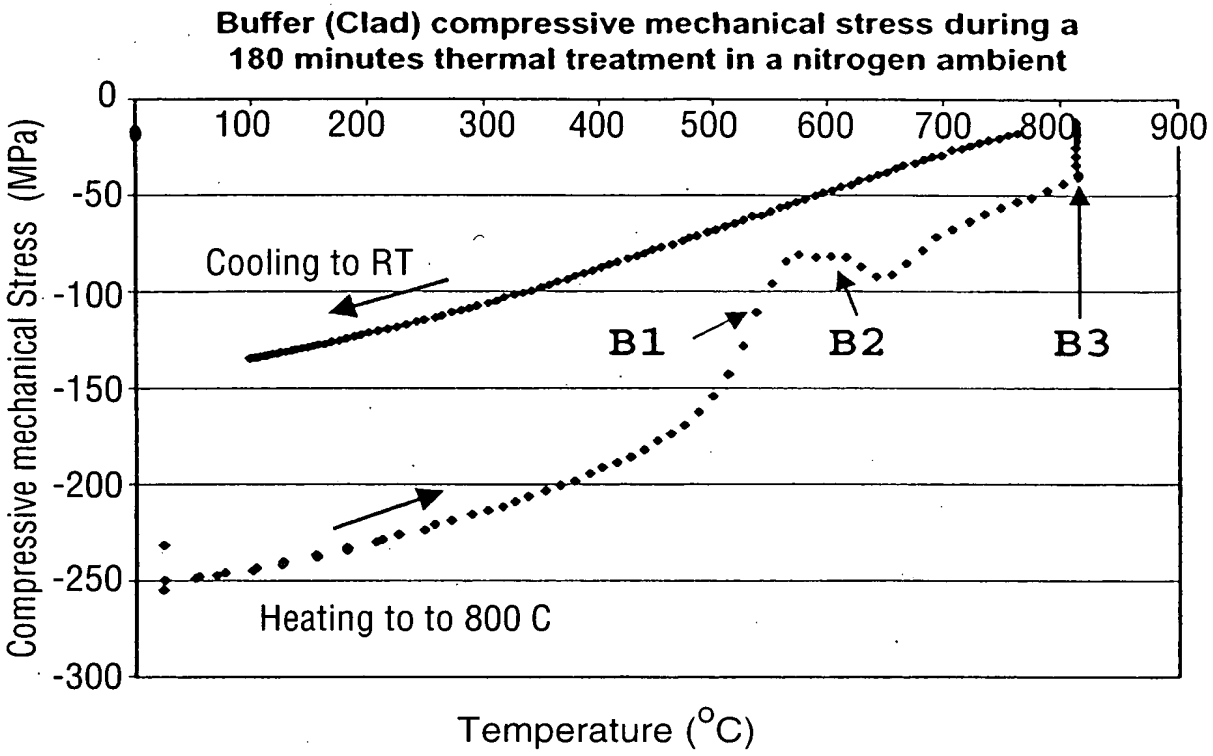

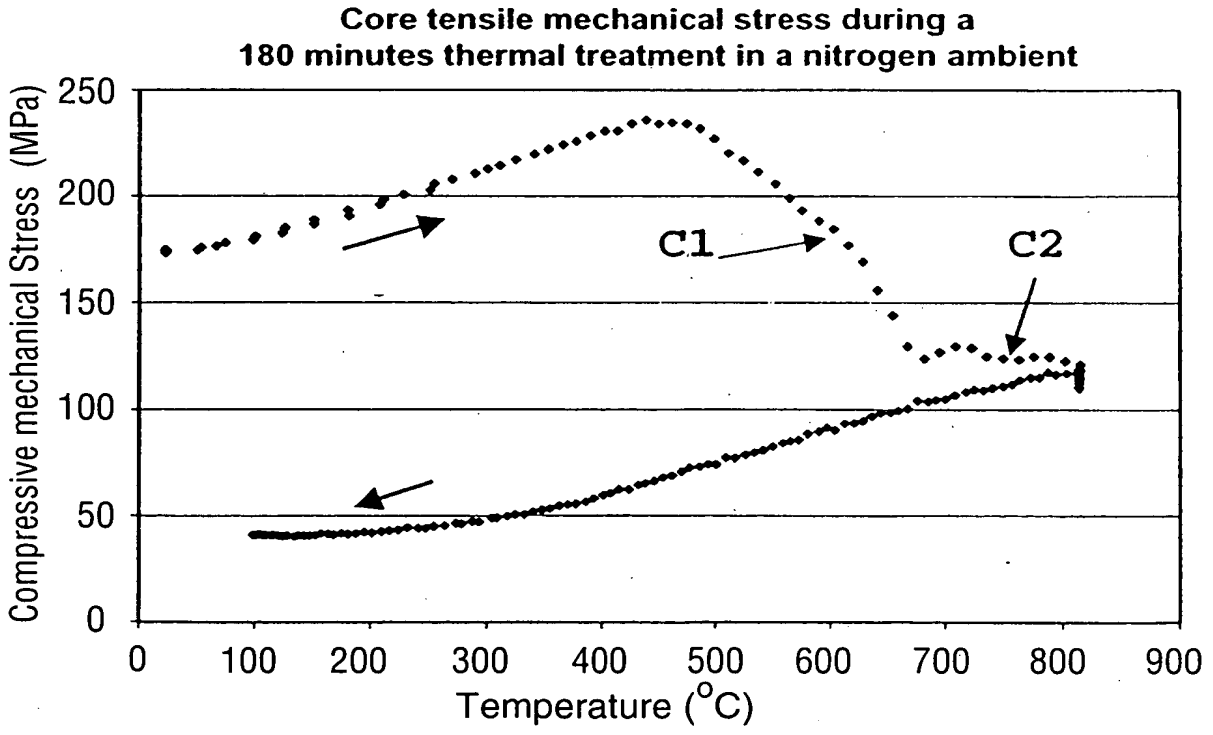

FIG. 10

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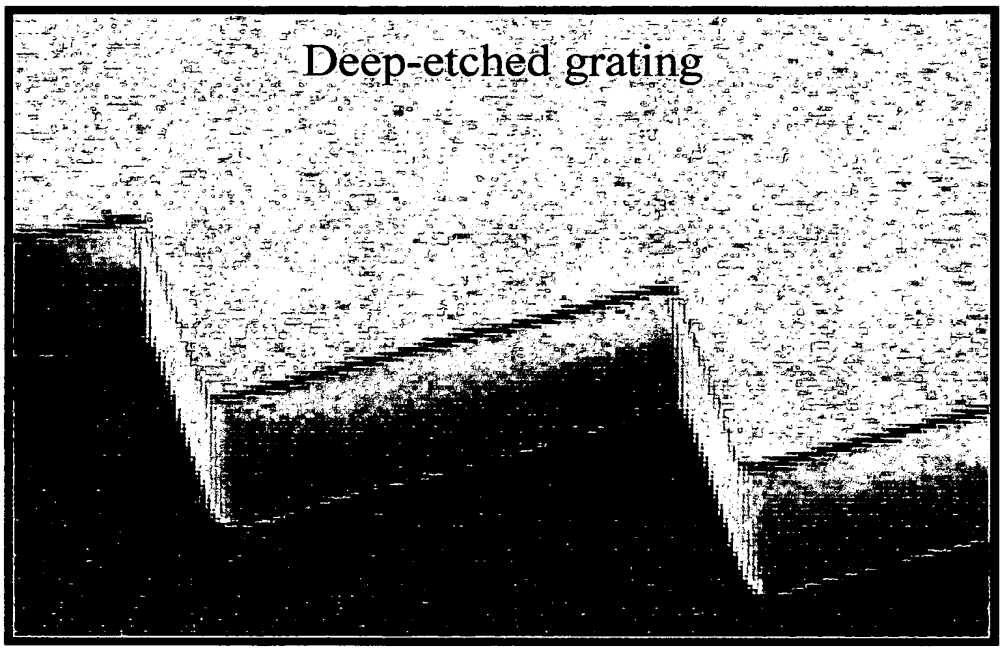

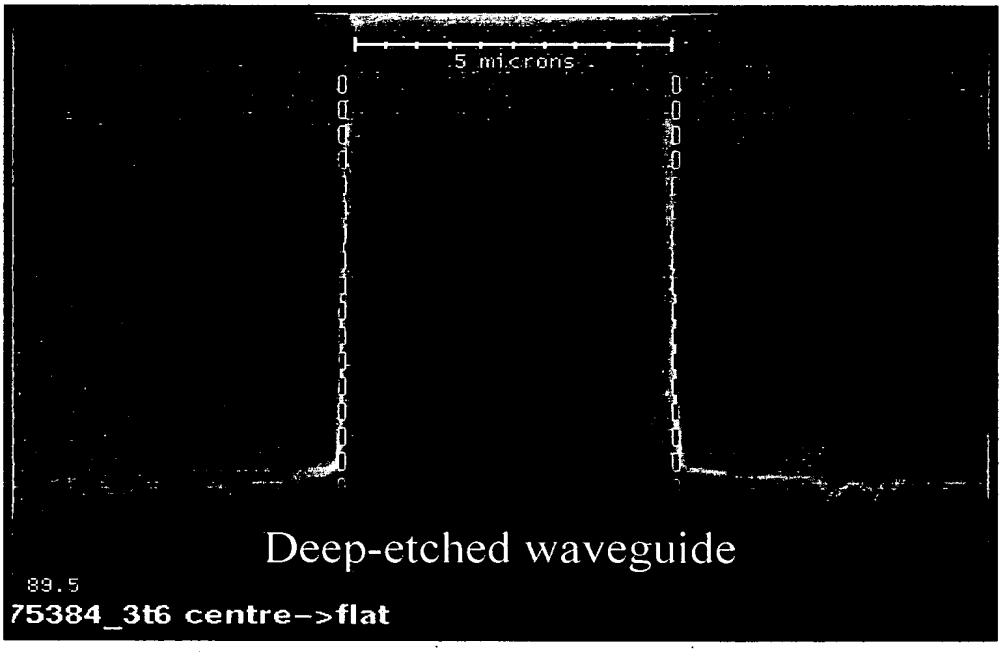

FIG. 11

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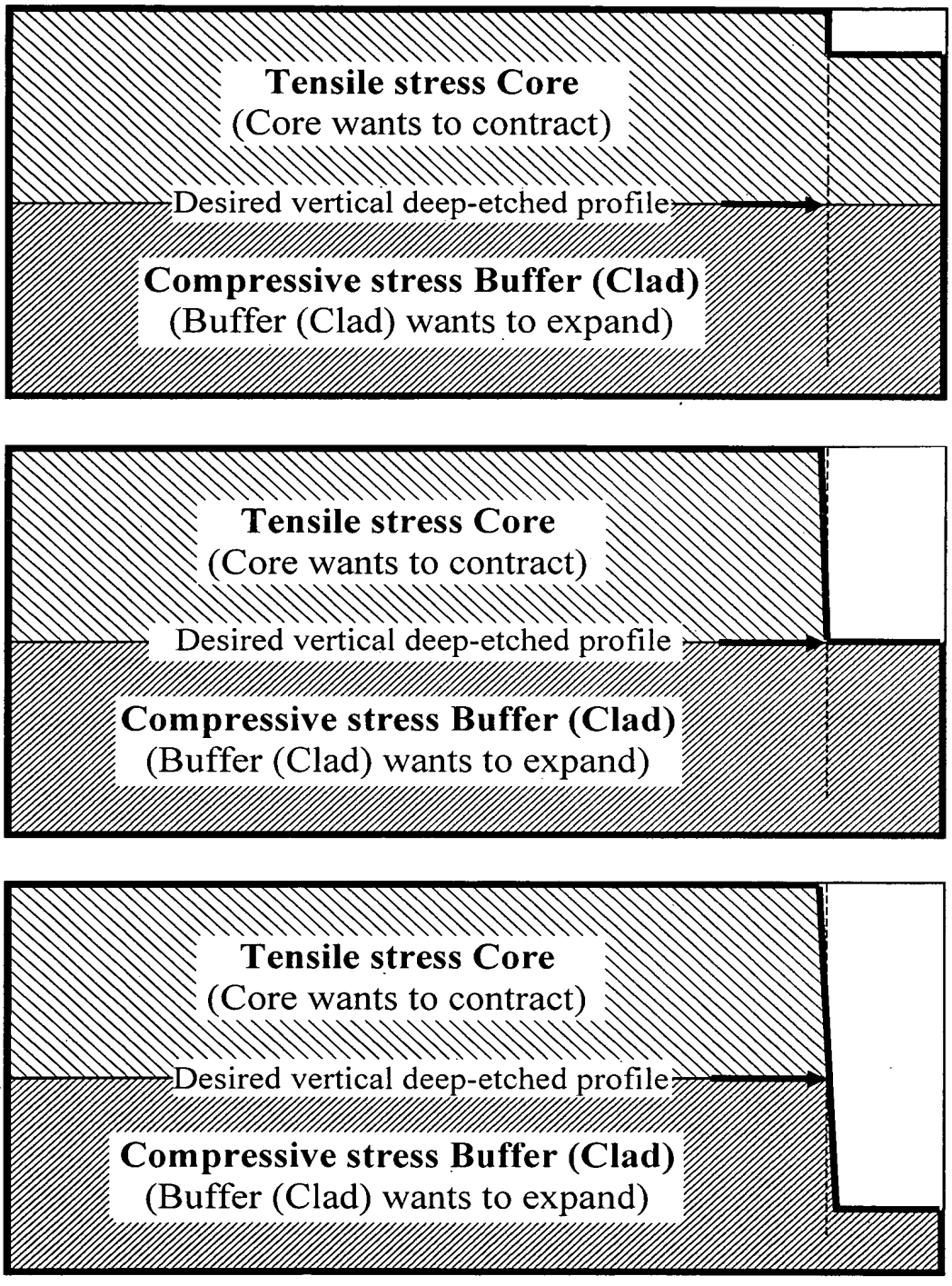

FIG. 12

OIPE JC99
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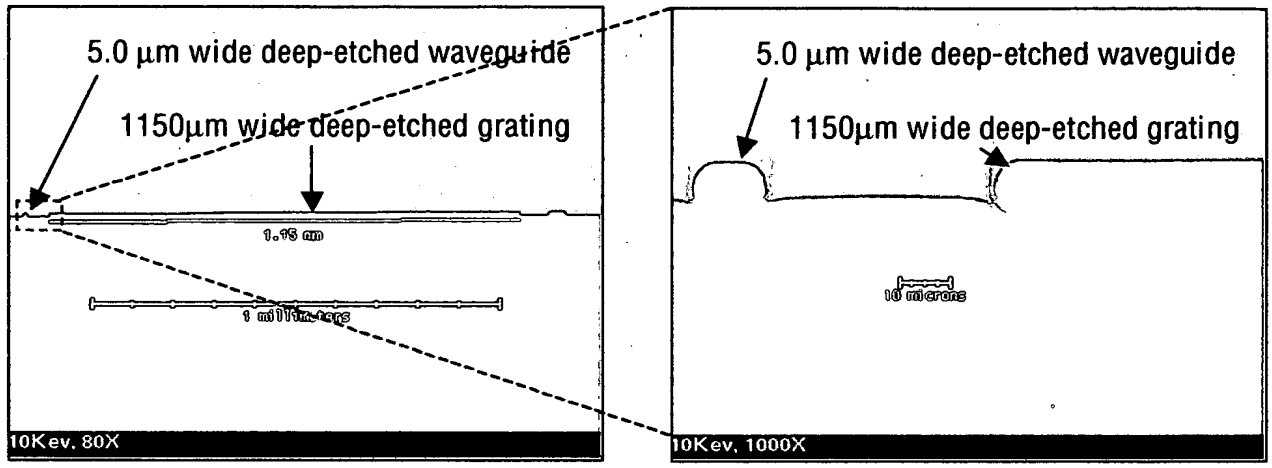
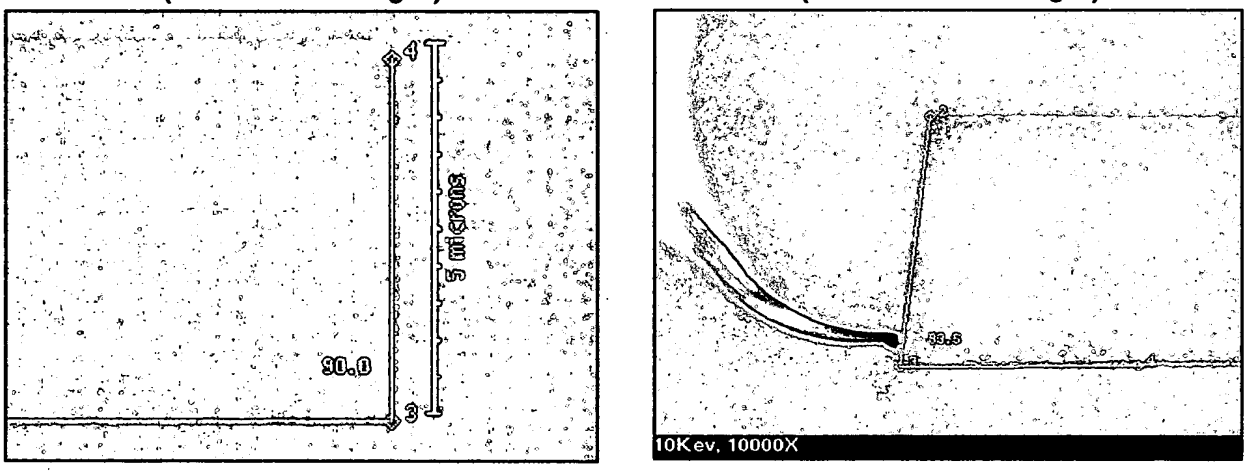


(a) (b)

5.0µm wide deep-etched waveguide (90° side-wall angle)

1150µm wide deep-etched grating (83.6° side-wall angle)



(c) (d)

FIG. 13

OIPE
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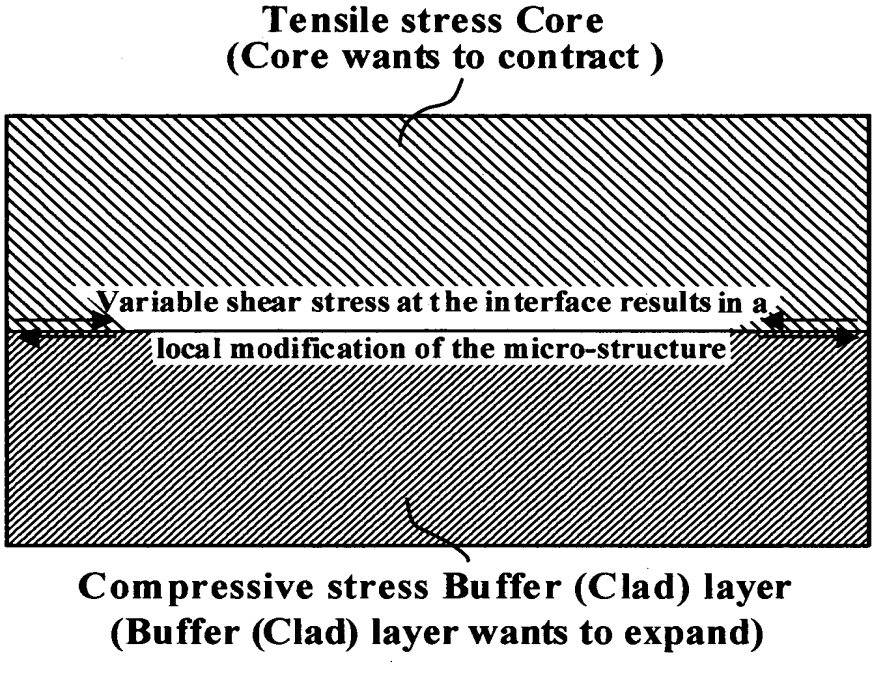
A/U 1762



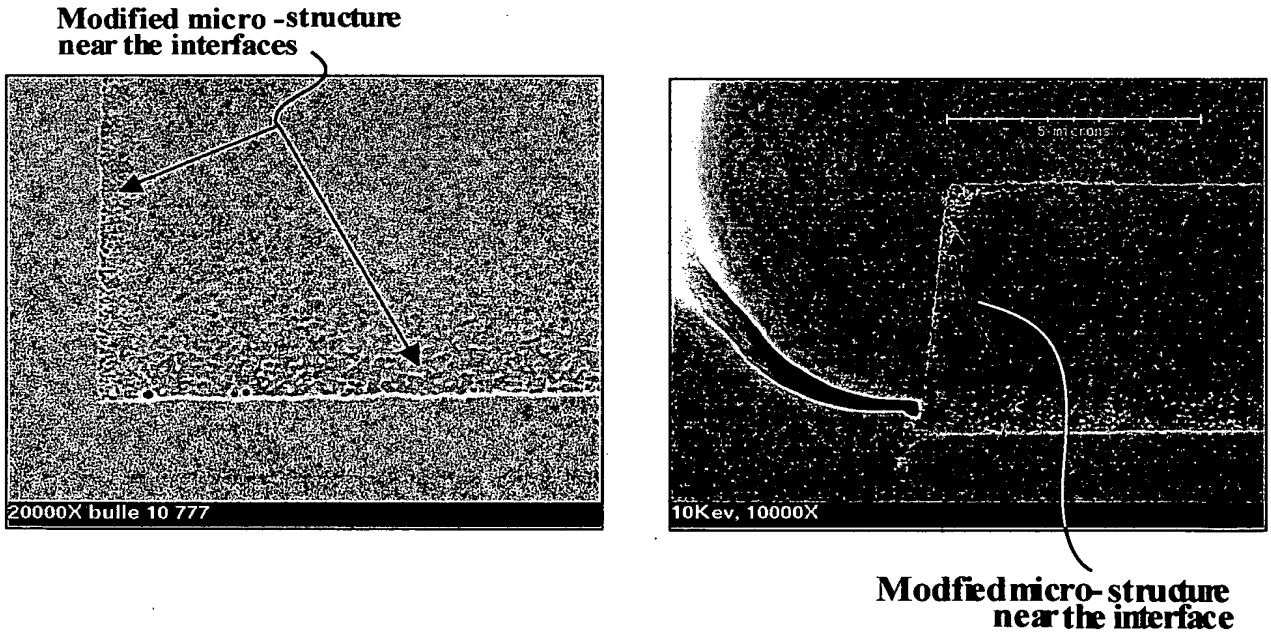


FIG. 14

SIN 09/956,916
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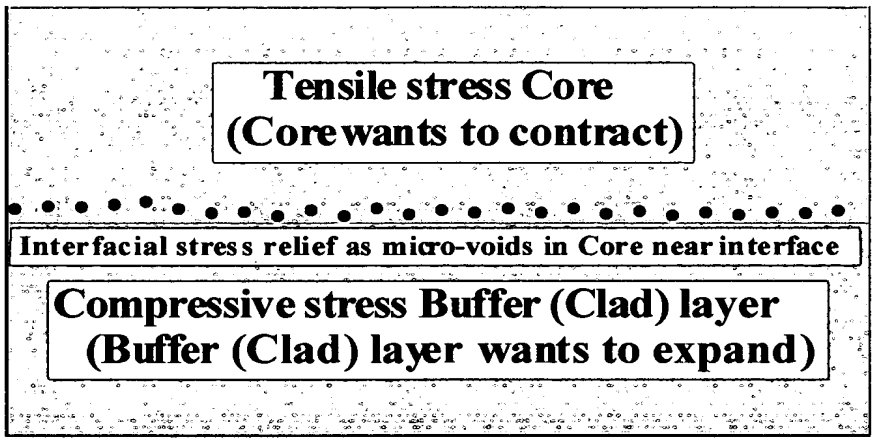

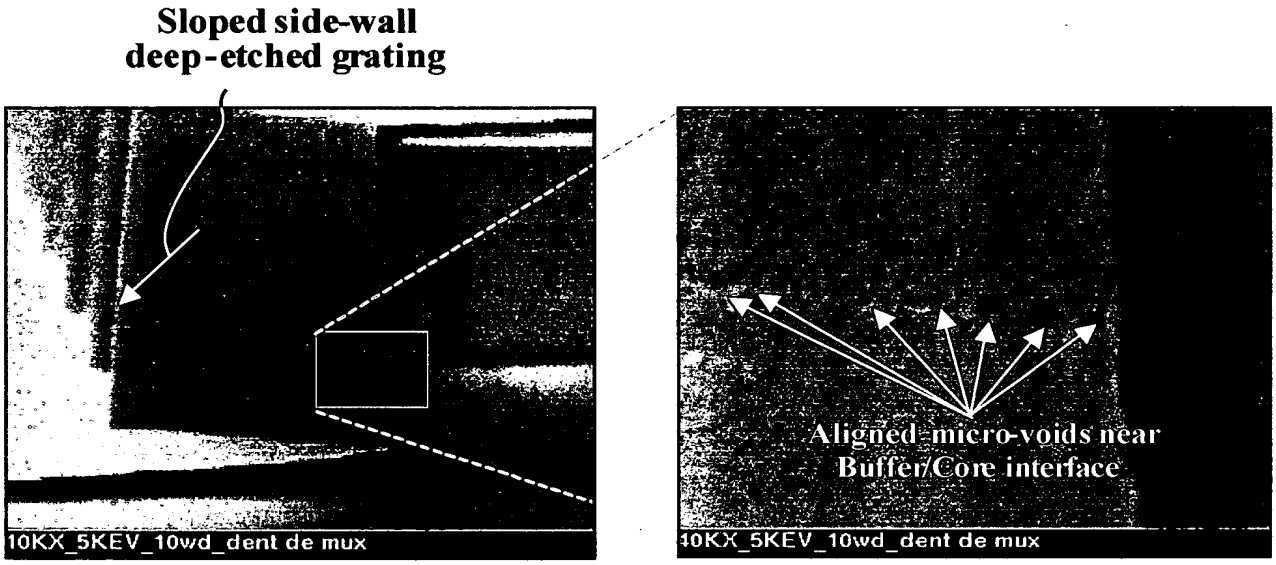

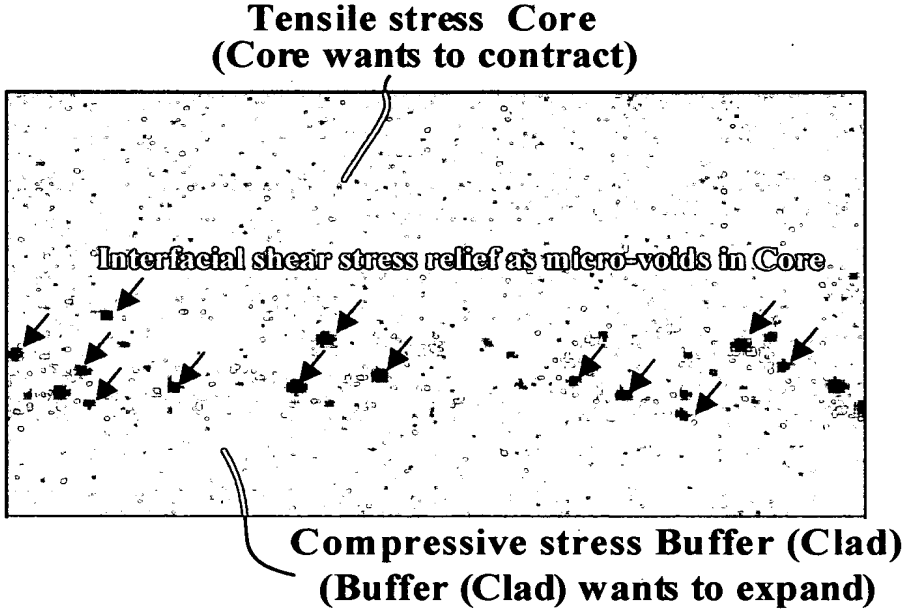

FIG. 15

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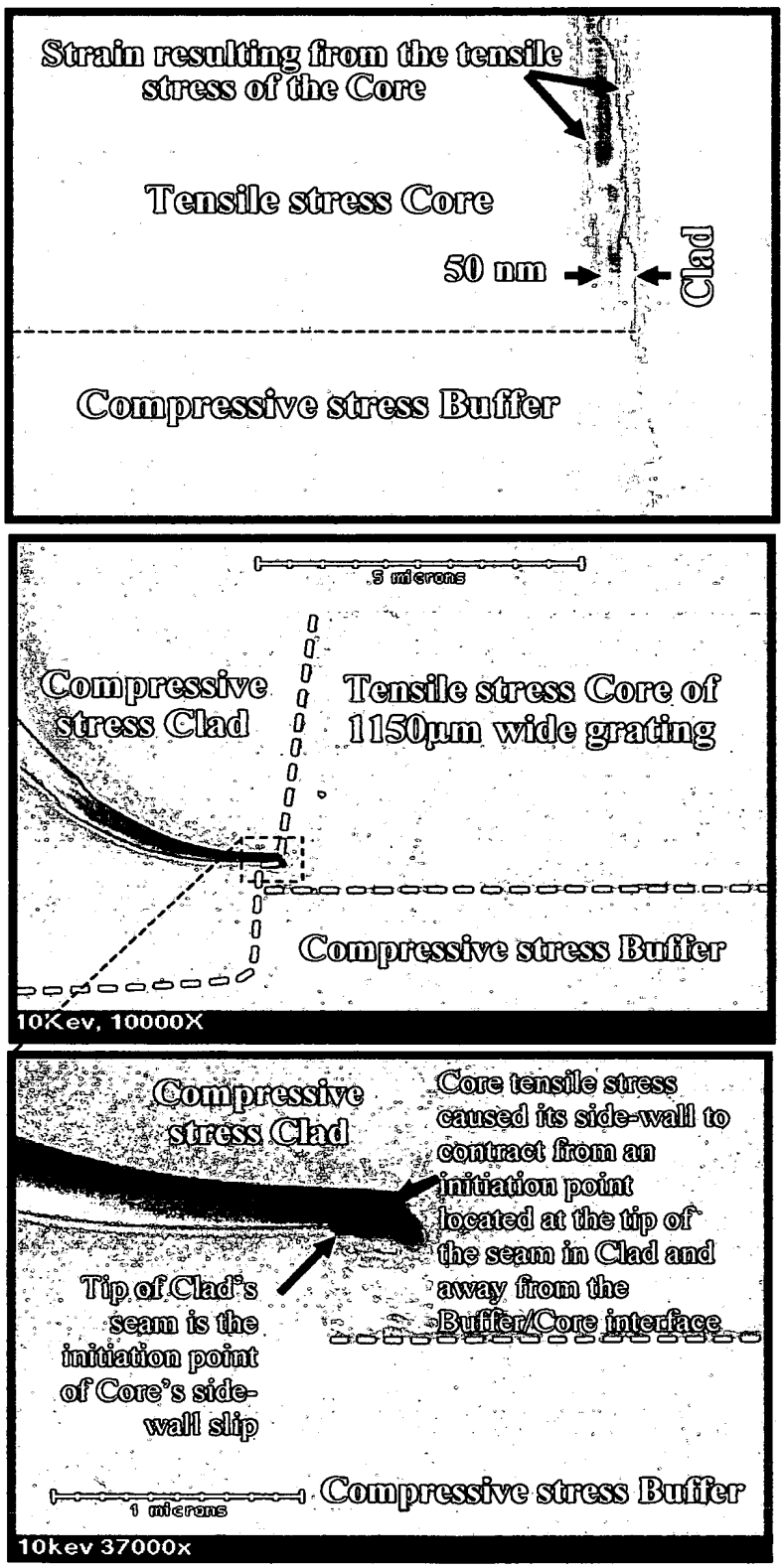

FIG. 16

OIPE
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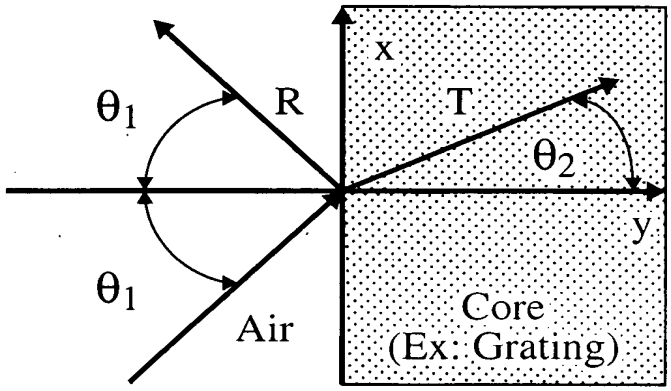

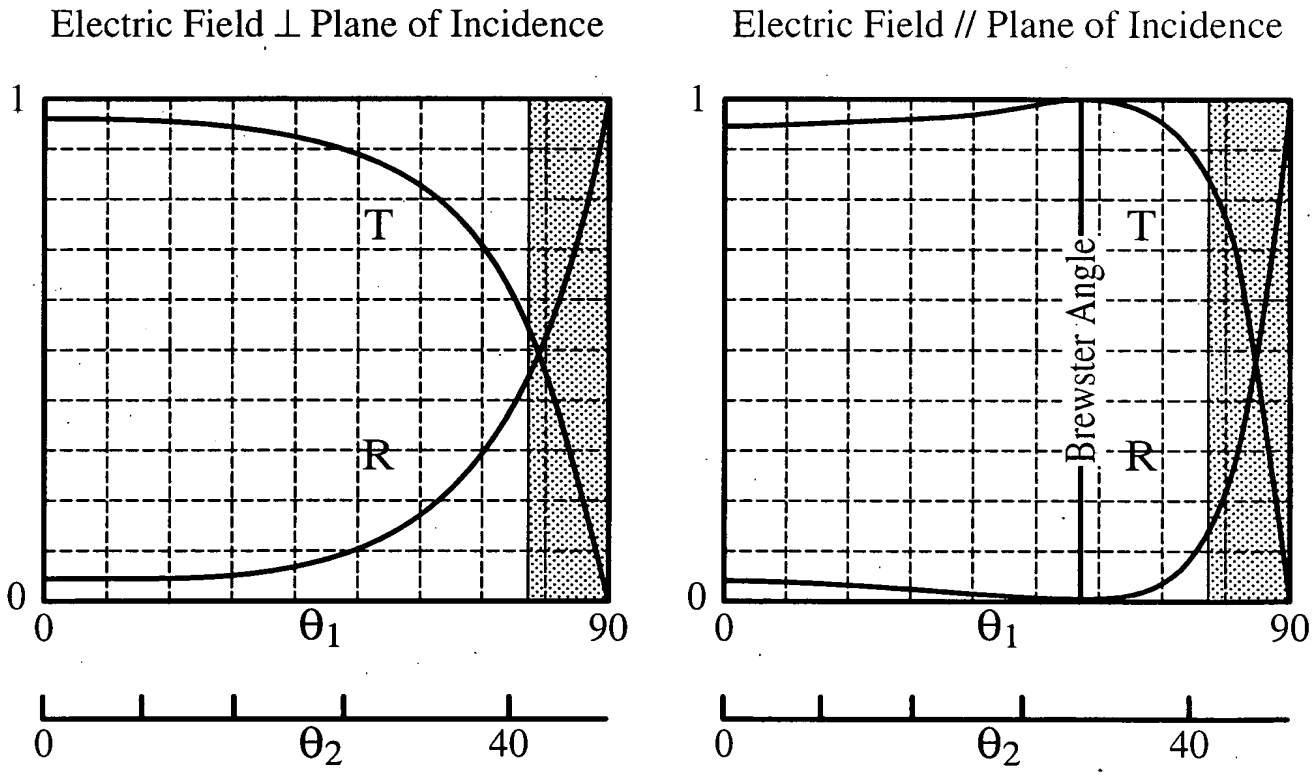

FIG. 17

OIPE JC99
FEB 04 2004
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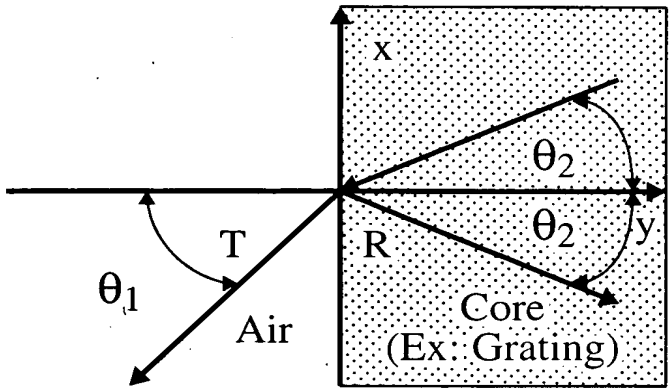
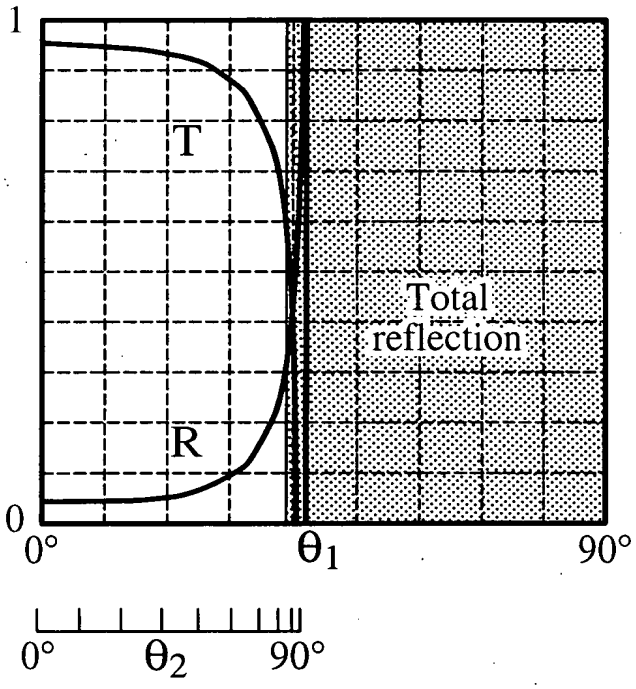
S/N 09/956,916
A/U 1762



Electric Field ⊥ Plane of Incidence



Electric Field // Plane of Incidence

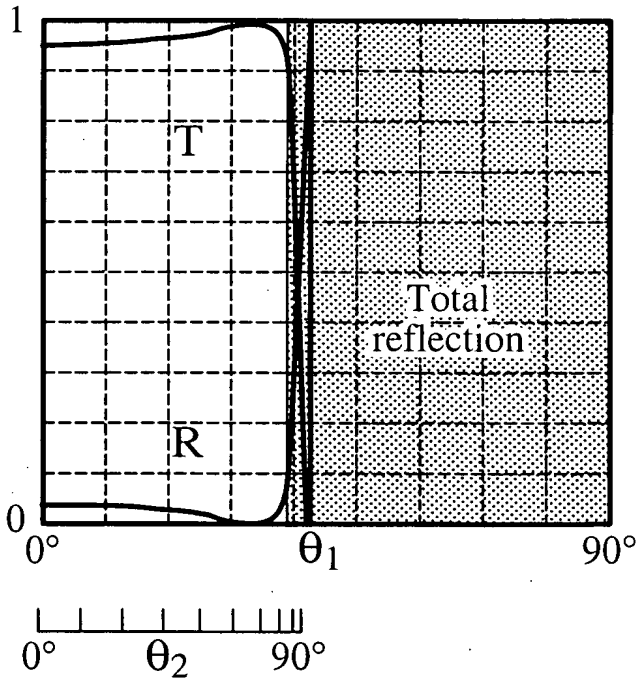


FIG. 18